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THIS STUDY COMPARED THE EFFECTIVENESS OF TWO METHODS OF ACQUISITION OF GRAMMAR BY CHILDREN. SPEECH DEVELOPMENT OF CHILDREN EXPOSED TO "EXPANSION" (REPEATING NEAREST COMPLETE SENTENCE APPROPRIATE TO CHILD'S PARTIAL STATEMENT) AND "MODELING" (EXPOSURE TO WELL FORMED SENTENCES) WERE COMPARED TO SPEECH DEVELOPMENT OF CHILDREN WHO RECEIVED NEITHER TREATMENT. THE STUDY HYPOTHESIZED THAT EXPANSION WOULD BE THE MOST EFFECTIVE. TWELVE CHILDREN, BETWEEN THE AGES OF 28 AND 38 MONTHS, WERE DIVIDED INTO THREE GROUPS ON THE BASIS OF (1) CHRONOLOGICAL AGE, (2) TALKATIVENESS, AND (3) INITIAL LEVEL OF LANGUAGE DEVELOPMENT. TAPE RECORDINGS WERE MADE AT THE BEGINNING, MIDDLE, AND END OF A 3-MONTH PERIOD. SIX MEASURES OF LANGUAGE DEVELOPMENT SERVED AS DEPENDENT VARIABLES. FIVE VARIABLES MEASURED ASPECTS OF SPONTANEOUS SPEECH AND ONE MEASURED THE ABILITY TO REPEAT SENTENCES. TWO TYPES OF STATISTICAL ANALYSES WERE USED AND THE VARIABLES WERE CONSIDERED BOTH TOGETHER AND SEPARATELY. TWO MAJOR RESULTS EMERGED--(1) ADJUSTED MEANS WERE HIGHER FOR THE INITIALLY LESS ADVANCED SUBJECTS ON ALL SIX MEASURES, AND (2) MODELING, NOT EXPANDING, WAS THE MORE EFFECTIVE TREATMENT. SUGGESTIONS FOR FURTHER RESEARCH INCLUDED (1) THE TESTING OF A LARGER SAMPLE OF SUBJECTS, AND (2) ALTERNATE HYPOTHESES WHICH TAKE INTO ACCOUNT THE EFFECTIVENESS OF INCREASED LANGUAGE EXPOSURE OVER EXPANSION. (PM)

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ENVIRONMENTAL ASSISTANCE TO THE CHILD'S ACQUISITION OF GRAMMAR

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Abstract

It is generally agreed that the quality of the child's language environment is the most important external factor affecting the rate of language development. It is not generally agreed what the critical features of that environment are.

Transcriptions of spontaneous conversation between parents and their two- and three-year-old children suggest that one feature of the parents' role is what has been termed "expanding": to the child's telegraphic utterance, e.g., Mommy lunch, the parent often responds with the nearest complete sentence that is appropriate in the particular situation, e.g., Mommy is having her lunch. To the content words of nouns, verbs and adjectives in the child's speech the parent adds mainly the functors: auxiliaries, prepositions, articles, pronouns and inflections.

One is tempted to assert that a powerful aspect of the child's environment has been identified. Expansions seem ideally suited for assisting the acquisition of grammar, the structure of language. It can be argued, however, that what is important for the child is not a particular kind of interaction but simply ample exposure to well-formed speech, that the critical role of the adult is not expanding but modeling. This experiment was designed to isolate these two aspects of the child's environment and to compare their effects.

Two hypotheses were tested: (1) Children whose language is

expanded or who merely hear more language spoken will show greater language growth than do children who receive neither treatment. (2) Of the two treatments, expanding will be more effective.

The subjects were twelve Negro children, age 28-38 months, attending a day-care center in Boston, Massachusetts. Four matched trios were formed on the basis of the child's chronological age, talkativeness, and initial level of language development. Within each trio the children were randomly assigned to one of three groups. One group (expansion) received 40 minutes per day of intensive and deliberate expansions; another group (modeling) received 30 minutes per day of exposure to an equal number of well-formed sentences that were deliberately not expansions. One of two tutors, trained for this research, talked with each child in these two groups in an individual play session every school day for three months. A third group (control) received no treatment.

Tape recordings were made of each child's speech at the beginning, middle and end of the three-month period. The tapes were transcribed by a secretary ignorant of the treatment assignment of the children, and the transcriptions were then coded according to strict rules. Six measures of language development served as the dependent variables. One was a structured test of the child's ability to repeat sentences. Five measured aspects of the child's spontaneous speech: mean length of utterance, noun phrase index, verb complexity index, copula index and sentence-type index. While mean length of utterance has been widely used as a measure of language development, the last four indices were devised for this research.

In evaluating the validity of these measures, I assume (1) that a developmental characteristic must either stay at the same level or increase; (2) that a valid measure of a developmental characteristic will yield scores conforming to that pattern to the extent that it taps the hidden current of developmental change; and (3) that fluctuation in the scores indicates, conversely, the presence of more superficial influences which decrease the validity of the measure. Means and standard deviations of the pretest, midtest and posttest scores and all before-after correlations were computed. The results indicated encouraging trends: all the means increased and most of the before-after correlations were high. All the standard deviations decreased, a finding which is discussed below. Intercorrelations among the measures were also computed to determine the relative independence of the measures.

Two kinds of statistical analyses were used to test the hypotheses. First, the six dependent variables were considered separately. A two-way analysis of variance (treatment × tutor and/or initial language level) was computed for the posttest scores on each measure with the pretest scores on that same measure as a covariance control. Then, in order to compare the children on their over-all growth on the six measures considered together, growth was defined operationally as the sum of the child's six gain score ranks. Friedman's nonparametric two-way analysis of variance was used to test the significance of group differences. The correlation between growth and initial language level, defined operationally as the sum of the child's pretest ranks, was also computed.

Two major findings emerge from these analyses. First, there is a high negative correlation between growth and initial language level. This appears in three forms. On the analysis of variance with covariance control the adjusted means are higher for the initially less advanced subjects on all six measures, significantly so on mean length of utterance. For the 12 subjects as a group, the correlation between growth and initial language level is -.86 ($p<.005$). Finally, the decrease in standard deviations from pretest to posttest, reported above, can be explained by the greater gain of the initially less advanced children.

Five possible explanations for this finding are discussed: (1) differential effectiveness of the tutors with which initial language level became statistically confounded, (2) a ceiling effect in the measures, (3) regression toward the mean, (4) spontaneous growth of "late bloomers," and (5) greater verbal deprivation of the less advanced children which the treatments, particularly modeling, helped to alleviate. I suggest that the true explanation is some combination of (2), (4) and (5).

The second major finding is that modeling, not expanding, is the more effective treatment. This appears in two forms. On the analysis of variance with covariance control, the adjusted means are highest for the modeling group on all six measures, significantly so (together with the control group) on the sentence imitation test. On the analysis of variance by ranks, the modeling group gained most and the control group least at an exact probability level of .042. This probability level may be inflated, however, because each child is

ranked on six somewhat correlated measures, and because the children randomly assigned to the control group happened to be at, or near, the upper end of their language-level range.

On the basis of these results, neither hypothesis is confirmed. The status of the first hypothesis is unclear. On the parametric analysis of variance there is no evidence of superiority of modeling and expansion groups over the control group; on the nonparametric analysis of variance by ranks there is such evidence, but the significance level is uncertain. The second hypothesis is rejected. There is no evidence that expansions, as provided in this research, aid the acquisition of grammar. All indications, without exception, suggest that modeling is the more effective treatment.

The surprising finding that expansions did not help as much as modeling suggests that richness of verbal stimulation may be a more critical feature of the child's language environment than is the contingency of the adult's response. Expansions are by definition contingent on the child's speech in content as well as timing. To the extent that they are pure expansions, just filling in the child's utterance to make the nearest complete sentence, they will have less variety of vocabulary and grammatical patterns than the adult's nonexpanding speech. The suggestion that the richness-impoverishment dimension is critical thus gains support.

Preface

This research was possible because other people gave generously of their time and their knowledge. My daughters, Betsy and Joanna, worked overtime on many of my household chores. My husband, Norman, read and commented on the entire manuscript. Dr. Robert H. Anderson, my advisor in the Harvard Graduate School of Education, provided encouragement throughout my graduate student career. Dr. John B. Carroll, also of the Graduate School of Education, answered many questions about the measurement of language development. Most of all, this study depended on the continual help of Dr. Roger Brown and his colleague, Mrs. Ursula Bellugi, of the Social Relations Department, Harvard University. In conception and execution my research was a "spin-off" from their longitudinal study of first language acquisition. I am deeply grateful to these persons and to others whose help is acknowledged in footnotes to this report. But responsibility for the results rests with the author.

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Chapter 1. The Problem

According to Kessen, "there is abroad in child psychology a renewed emphasis on the stimulus; that is, on the specification of environmental events antecedent to behavior which shows 'maturational change'" (1962, p. 69). This is as it should be. Human development is by nature assisted development, and any study of development must try to describe the kind of assistance that is available. The research reported here is one attempt to isolate for intensive analysis two aspects of the child's language environment and thereby to compare their effects on the child's acquisition of grammar. The study was designed both as basic research into the mechanisms of first-language acquisition and as a field test of two possible components of an educational program for very young children.

The basic research aspect relates this work to Brown's longitudinal study of the child's acquisition of grammar (R. Brown & Bellugi, 1964; R. Brown & Fraser, 1964). Grammar is "the systematic structure which is the real essence of speech" (Gleason, 1961, p. 57). It includes both morphology, the combining of morphemes into words, and syntax, the combining of words into larger units such as sentences.

Brown's protocols are transcriptions of spontaneous conversation between parents and their two- and three-year-old children. One feature of the parent's role is what Brown (R. Brown & Bellugi, 1964) has termed "expanding": to the child's telegraphic utterance, e.g., Mommy lunch, the parent often responds with the nearest complete sentence which is appropriate in the particular situation, e.g., Mommy is having her lunch. To the content words of nouns, verbs and adjectives in the child's speech the parent adds the functors: auxiliaries, prepositions, articles, pronouns, and inflections.

One is tempted to assert that a powerful aspect of the child's environment has been identified. Expansions seem ideally suited for assisting the acquisition of grammar. It can be argued, however, that what is important for the child is not a particular kind of interaction but simply ample exposure to well-formed speech, that the critical role of the adult is not expanding but modeling. When evidence is limited to observations in natural situations it is not possible to separate these two features of the child's language environment. The experiment reported here was designed to achieve that separation.

As a small-scale educational program this work bears on the problem of cultural deprivation. Urgent demands are being made for better education for children from urban slums. There is general agreement that one source of the difficulties these children face in school is the inadequacy of their oral language (Deutsch, 1963). Just as the identification of vitamins necessary for good health can suggest the administration of those vitamins to prevent undernourishment, so the identification of environmental conditions which assist language development can suggest a curriculum that can alleviate the severe cultural deprivation that inadequate language brings.

Background

Lenneberg asserts: "The ability to learn language is so deeply rooted in man that children learn it even in the face of dramatic handicaps" (1964b, p. 67). Let us assume this is true. Let us also assume that work now in progress (reported in Bellugi & R. Brown, 1964) will eventually lead to the discovery of a developmental sequence common to all children learning a particular language. We will still need to explain large individual differences in the rate at which language development proceeds. Because they vary with such gross aspects of the environment as home vs. institutional care, social class status, ordinal position of the child in the family, etc., individual differences in learning rate cannot reasonably be ascribed to neurology alone. "All the available evidence . . . supports the general prediction that the quality of a child's early linguistic environment is the most important external factor affecting the rate of language development" (Carroll, 1961, p. 340).

Analysis of the critical features of the linguistic environment has been stimulated from four directions: a long-standing concern for the crippling effects of institutional care of infants (Cassler, 1961; World Health Organization, 1962; Yarrow, 1964); more recent concern over the effects of cultural deprivation (summarized in Bloom, Davis & Hess, 1965); attempts by psychologists to substantiate theories of learning by fitting them to the child's strikingly successful acquisition of language (e.g., Staats & Staats, 1963); and derivation from the transformational model of language of necessary implications for the process of acquisition (Katz, forthcoming; McNeill, forthcoming).

I will summarize the results of these analyses under three headings: context or the non-verbal setting in which language occurs, stimulation, and responses to the child's speech.[1]

Context

Four features of the non-verbal context of language development may be important: the affective relationship between the child and the person who is talking to him, whether that person is an adult or another child, how varied the contexts are, and the prevailing signal-to-noise ratio.

Affective relationship. There is widespread emphasis on the key role in language development of the mother-child relationship. It is difficult to test the specific influence of that relationship, however, because warm feeling and lots of talk tend to occur together. This difficulty crops up when institutional care is contrasted with home care (e.g., Province & Lipton, 1962) and also when significantly different home environments are compared (e.g., Milner, 1951). Cassler suggests that emphasis on specific effects of maternal love has largely reflected psychoanalytic thinking and that "the physical, intellectual and emotional deficits often observed in indivuduals deprived of mothering during early infancy can best be explained in terms of perceptual deprivation" (1961, p. 42).

Adult vs. child. Children talk with adults and with other children. Do the relative amounts make a difference? Hockett (1950) claims that the influence of other children is greater, and Jespersen (1922) finds it both greater and more beneficial. It is not clear what features of language are being considered nor on what evidence their judgments are based. If children speak alike, the similarity can be due to parallel but independent developmental processes. Jesperson speaks specifically to the influence of the peer group beyond age three, but a good deal of language learning--especially of grammar--takes place earlier. A child's speech may be strongly influenced by the speech of his siblings. But Jespersen's statement that "the second or third child in a family will, as a rule, learn to speak more rapidly than the eldest" (1922, p. 147n) is contradicted by other evidence that the speech development of children without siblings is generally superior (McCarthy, 1954; Nisbet, 1961). R. Brown's work, previously cited, includes a study of child-parent dialogues, but I know of no comparable analysis of the conversation between a young child and his peers or siblings.

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[1] Gray & Klaus (1964) categorize experiential differences along three stimulus and five reinforcement dimensions, subsuming context under stimulus.

The literature on general modeling behavior is extensive but inconclusive. Bandura (1963) reports two studies in which adult models proved more powerful than child models. Hartup, on the other hand, found that "the frequency with which the child chooses to imitate . . . is generalized across models" (1964, p. 190).

Variety. A child's language develops in contexts of greater or less variety. Deutsch & B. Brown (1964) suggest that variety in family activities increases verbal interaction. Ausubel (1964) writes of the desirability of a wide range of objects which can serve as referents for speech. John & Goldstein (1964) discovered that a group of lower-class Negro four-year-old children had trouble on the Peabody Picture Vocabulary Test with such action words as digging and tying. They suggest that a word like digging differs from a word like Coca Cola in the stability of the word-referent relationship. "Gerunds such as 'tying' were failed, not because the children were deficient in experience with the referent, but rather because they had difficulty in fitting the label to the varying forms of action observed and experienced" (John & Goldstein, 1964, p. 269). They argue that the process of generalization and discrimination involved in learning the meanings of more abstract words does not come about simply through "receptive exposure" to many examples of the category but through "active participation with a more verbally mature individual" (John & Goldstein, 1964, p. 273). Thus the benefits of variety in nonverbal experience may depend on the availability of help in encoding that experience in words.

Varied surroundings can also stimulate and reinforce different functions of language. Basil Bernstein contrasts "restricted" and "elaborated" codes, and asserts that working-class speech is characterized by a restricted code which "is played out against a background of communal, self-consciously held interests which removes the need to verbalize subjective intent and make it explicit" (1962a, p. 32). It may be that during the period of language learning children who are confronted with a narrow range of close personal contacts learn only the economical mode of communication that suffices within that small circle. Such environmental effect, if it exists, would probably bear less on the rate at which the structure of language is learned than on what it is used to say.

Signal-to-noise ratio. Deutsch (1963) discusses the relevance to language learning of the overall signal-to-noise ratio prevailing in the daily environment. One characteristic of slum living which may contribute to language retardation is the high noise level, not only in the literal sense of noise but in the minimum of non-instructional conversation directed toward the child. This situation is ideal for inducing habitual inattention. The child learns to "tune out" both meaningless noise and the occasional meaningful stimuli, and the result is an absolute decrease in the effective stimulation.

Thus, except for the unknown role of high affective quality such as may be uniquely present in the mother-child relationship, the environmental contexts of early speech probably exert their influence through the amount and kind of stimulation and response available to the child. It also seems likely that this influence is more on semantics and function than on grammar and the rate at which it is learned.

Stimulation

Language stimulation can vary both in quality and in quantity. The quality of the stimulus in turn can vary along the lines of correctness, variety and sequence.

Correctness. By correctness, I mean conformity to the rules of Standard English (Fries, 1940). Ausubel (1964) lists "faulty syntactical model" as one factor in language retardation. Yet if the causes of language retardation are to be evaluated properly it is necessary to distinguish between two possibilities:

> (1) Children of lower SES [socio-economic status] are learning the language of their parents at about the same rate as children of higher SES are learning the language of their parents but the language of lower SES parents is, in various ways, different or substandard. (2) Children of lower SES are learning the language of their parents less rapidly than children of higher SES are learning the language of their parents (R. Brown, personal communication, 1963).

Only the latter possibility is relevant here. "Children's grammar converges on the norm for the community in which they live" (Ervin, 1964, p. 163). If that norm is not Standard English some of the effects may be regarded as unfortunate from other standpoints. But when we study the rate of language development as such, a child's progress can be judged only in terms of his approach toward the norm for his particular language community. Whether the nature of that norm can itself affect development is an open empirical question.

Variety. Above I spoke of variety in the non-verbal settings in which language occurs. Here I am referring to variety in the words and grammatical patterns which the child hears. An interesting question is whether greater variety in words and patterns, as measured by the type-token ratio for example, bears any relation to the difficulty of the learning task.

W. Miller & Ervin (1964) raise this question with specific regard to a child's developing use of the plural inflection. Starting from non-contrast (using boy for both singular and plural), the child occasionally uses contrasted forms, then correctly contrasts all familiar words, and finally generalizes to irregular nouns (foots) and --in an experimental situation--to nonsense words (biks). Contrast with familiar forms always precedes generalization to nonsense forms, but the time lapse between the two stages varies. W. Miller & Ervin point out that "We do not know whether it is the variety of types or the frequency of tokens showing contrasts which is crucial in determining the length of time before generalization occurs" (1964, p. 33).

Learning of a productive rule has been considered a concept formation task. Variation in irrelevant features of the concept usually aids learning. If such variation does in fact aid the acquisition of grammar, its absence could explain much about the association between an impoverished language environment and retarded language development. It is worth considering, at least as a possibility to be explored, that language that is impoverished is harder--not easier--to learn.

In contrast to variety are the well-learned routines. These may include sentences such as I don't know; they may also include bits of nursery rhymes and songs, and phrases from books read to the child many times. A long time ago Carroll suggested that "An interesting investigation could be set upon the hypothesis that learning of rote material is an important factor in speech development" (1939, p. 222). That investigation remains to be done.

Sequence. In analyzing the detrimental effects of the slum environment, Deutsch suggests that "In addition to the restriction in variety . . . it might be postulated that the segments made available to these children tend to have poorer and less systematic ordering of stimulation sequences, and would thereby be less useful to the growth and activation of cognitive potential" (1963, p. 168).

Variety can be described in absolute terms, e.g., by the type-token ratio, but sequence cannot. For while an optimal sequence may incorporate some absolute dimension of complexity, there remains as a relative component the "match" between the stimuli the child encounters in his environment and the cognitive structures which determine his readiness to respond to them (Hunt, 1961, pp. 267-288).

This match can be improved in two ways. The adult might provide a rich and varied supply of stimuli and let the child find what he needs. This was the principle involved in the self-selection infant feeding practices of some years ago; it is also the principle recommended by the Montessori method (Hunt, 1964). Applied to language development, this principle would predict that if a child has the chance to hear a sufficiently varied and large sample of well-formed sentences, he will take from it what he needs for the acquisition of his own language system.

Alternatively, the adult might pre-select certain stimuli for the child. Such pre-selection could be either purposeful or fortuitous. For first language learning it would have to be fortuitous, since no one knows enough about what the child is doing to plan a curriculum for him. As we shall see in the discussion of adult responses to the child, such a fortuitous match may actually occur.

Quantity. The language stimulation available to a child can and clearly does vary in quantity. And it seems intuitively obvious that differences in quantity should affect language development, though frequency of exposure may matter only up to some threshold, beyond which no additional benefits accrue. But severe problems face any attempt to separate the effects of frequency of stimulation from the effects of responses to the child's speech.

Most of the evidence comes from studies of infants. Detailed comparisons have been made of caretaking activities of parents in homes and of adults in institutions (Rheingold, 1960; Rheingold, 1961; Province & Lipton, 1962). There is notably more talking to the infants at home, five to nine times as much according to Rheingold's time-sampling data. There is likewise more vocalization by the infants themselves.

Experimental studies with infants offer convincing evidence that reinforcement rather than stimulation is operating here. Rheingold, Gewirtz & Ross (1959) reinforced the vocalizations of three-month-old infants by simultaneously smiling, vocalizing and touching. This produced a significant increase in the amount of infant vocalizing. But the authors note that the adult behaviour could be acting as social stimulation rather than reinforcement. Weissberg's (1963) study separated these two possibilities. With the same age infants he used five experimental conditions: no adult, adult present but motionless, non-contingent social stimulation, non-contingent non-social stimulation (with chimes), contingent social stimulation and contingent non-social stimulation. He found a significant increase in infant vocalization only under the fourth condition where the social stimulation was contingent on the infant vocalization and thereby reinforced it. These studies have been widely cited in support of reinforcement theories of language learning, which will be discussed in more detail in the next section. But it is questionable whether any results should be generalized across the discontinuity which probably separates pre-linguistic babbling from true verbal behavior.

Once a child has started to speak it is no longer feasible to withhold response for experimental purposes. Consequently, the effects of merely exposing the child to language and of responding to his language are inevitably confounded. Belief that exposure alone is sufficient receives some support from the occasional stories of children who remained silent for a long time and then started to speak in mature patterns (Ervin, 1964, p. 163). The pure case could be that of a child who heard speech only over television, but fortunately such a child exists only as a theoretical extreme. An argument that more than exposure is necessary could be made on the evidence that children from the lowest social class groups, who are known to be retarded in language development, watch as much as or more television than do culturally more advantaged children (e.g., Wortis, 1963). But of course other debilitating influences undoubtedly occur along with the increased exposure to television.

Irwin's (1960) work is unique in its attempt to study experimentally the effect of increased language stimulation. In previous studies, Irwin (1948a; 1948b) had established that beginning at about eighteen months a correlation exists between socio-economic status and the amount of child vocalization, in terms of phoneme tokens and types. He then induced working-class mothers to read to their children for 20 minutes a day from the time the children were 13 months until they were 30 months old. The result was a significant increase in production of sounds, again both in tokens and in types.

Irwin interpreted this result as a response to the systematic increase in the "speech sound stimulation" (1960, p. 189). While reading could indeed have provided an increased quantity of stimulation alone, it is possible and even likely that in the course of reading the mothers also responded to the vocalizations of the child which the reading may have prompted. Moreover, we do not know how this induced attention to the behavior of her child may have affected the mother's response to him during all the non-reading parts of the day.

The confounding of adult stimulation and adult response also exists when we take as a dependent variable the emergence of specific grammatical constructions in a given individual child. This is discussed below, after the category of adult responses called expansions is described.

Responses to the Child

It is generally believed that adult responses facilitate language development when they provide "reinforcement" or "feedback." The following discussion is an attempt to determine whether either of these terms can indeed apply.

Reinforcement. In his introduction to Language in the Crib, G. Miller summarizes a widely held view of the language learning process, a view with which he disagrees.

> Among psychologists in the United States there has been general agreement that language learning is much like any other kind of learning. That is to say, we have usually assumed that language learning depends critically upon a supporting environment that will respond to the child's vocalizations, that will approve or correct, that will reinforce successes and extinguish failures until the proper stimulus-response connections are established (1962, p. 15).

In this view the concept of reinforcement is central.

A reinforcer is any "stimulus event that will maintain or increase the strength of a response or stimulus-response connection associated with it" (Deese, 1956, p. 16). In applying the concept of reinforcement to the process of acquiring language it is necessary to specify just how differential reinforcement directs a child's verbal behavior toward more mature constructions. Three ways are possible.

Reinforcement theory has been applied successfully to repertoires of continuous movements. Here the criterion for reinforcement can be shifted so that the terminal behavior is reached by a series of successive approximations. A correct movement is reinforced and thus tends to be repeated. Because movement cannot be completely stereotyped, random fluctuations continue around the reinforced point on a continuum. A particular variation in the desired direction is then reinforced and the fluctuation continues around a new point nearer to the goal. In this way a pigeon can be taught to stand in the corner. But no one has demonstrated that such a process can apply to any aspect of learning a first language with the possible exception of phonology, and there are questions even about that (Ervin & W. Miller, 1963). A child's speech does not consist of random trials, and there is no evidence that adult responses, verbal or non-verbal, match the degree of the child's approximation to the adult model.

Reinforcement might be possible if speech were learned in a series of two-choice situations. Where there are only two possibilities, one must be right and the other wrong. Non-reinforcement of one then leads to its extinction and to increased probability for the other. But with language the number of possibilities is staggering.

How could withholding of reinforcement from instances of childish speech help the child find the way to a well-formed sentence?

Adult reinforcement of speech as such may increase the gross amount. Evidence for this effect does exist, at least during short experimental sessions (Salzinger et al., 1962). But increase in the sheer amount of speech cannot of itself lead to progress in language learning save as it makes available more frequent opportunities for some other process to operate, or as it brings about increased sensitivity to more potent influences. To contradict an old proverb, practice alone does not make perfect. Practice helps only to stabilize response at some particular level. Improvement in the sense of stabilization has been shown for such behavior as drawing a line of a given length (Seashore & Bavelas, 1941), making perceptual judgments (Gibson, 1953), and imitating sounds from a foreign language (Lane & Schneider, 1963). But the cause of change in the direction of the adult model must lie elsewhere.

Additional arguments against the applicability of the concepts of trial-and-error and reinforcement have been given by Chomsky (1957), Church (1961), and Lenneberg (1964a).

Feedback.. Hilgard proposes that for most non-laboratory human learning the concepts of "provisional try" and "feedback" are more useful (1956, pp. 469-472). Where reinforcement looks merely to the increased probability that a given behavior will be repeated, the concept of feedback implies a positive and continuous influence for change.

> If . . . the information which proceeds backward from the performance is able to change the general method and pattern of performance we have a process which may well be called learning (Wiener, 1954, p. 61).

In the case of language learning, it can be hypothesized that the child gets from somewhere a non-chance approximation to a well-formed utterance and receives an informative response which indicates the direction toward the point of convergence with the adult language. The expression "from somewhere" is chosen carefully to signify that the source of this first approximation is at present controversial. I will return to this point in the final section of this chapter where the hypotheses to be tested are placed in the context of alternate theories of language learning.

It is commonly assumed (e.g., Ausubel, 1964, and Bloom *et al.*, 1965) that where language has developed well something termed "corrective feedback" has been in ample supply. What is the evidence? For correction to exist, the child must make errors and the adult must recognize those errors. W. Miller & Ervin give this summary of errors in the speech of two- and three-year-old children:

> Most of the mistakes or deviations from the model can be classified as omissions (*I'll turn water off* for *I'll turn the water off*), overgeneralization of morphophonemic combinations (*foots* for *feet*); *a owl* for *an owl*; *breaked* for *broke*); the incorrect use of a function word with a subclass of a lexical class (using *a* with mass nouns and proper nouns), or doubly marked forms (adding the possessive suffix to a possessive pronoun, *mine's*) (1964, p. 26).

While no frequency counts are yet available, it is safe to say that except for the category of omissions, the proportion of errors in the young child's speech is remarkably small. Furthermore, it is my strong impression that adults without special training do not "hear" such errors even when they are made. Even persons trained to be attentive often cannot catch them except under special conditions, such as repeating tape recordings at half speed. Ordinarily, we hear what we expect to hear--normal English speech. The bright sayings often repeated to grandparents are not apt to hinge upon these grammatical irregularities or overregularities. Not surprisingly, R. Brown and his colleagues found "little correction of children's speech by their parents" (conference discussion in Cofer & Musgrave, 1963, p. 203).

Sentences showing errors of omission are a very different matter. Such sentences constitute the typical "telegraphic speech" of the young child (R. Brown & Bellugi, 1964; R. Brown & Fraser, 1964), and gradual filling in of the omitted morphemes is the most prominent change characterizing the child's acquisition of grammar. From transcriptions of the speech of two children with their respective parents, R. Brown and his colleagues discovered that parents frequently responded to the child's telegraphic utterance with "expansions":

> The Mothers of Adam and Eve responded to the speech of their children with expansions about thirty per cent of the time. We did it ourselves when we talked with the children. Indeed we found it very difficult to withhold expansions. A reduced or incomplete English sentence seems to constrain the English-speaking adult to expand it into the nearest properly formed complete sentence. Table 3 lists a few sample expansions from the hundreds in the records.

Table 3

Expansions of Child Speech Produced by Mothers

Child	Mother
Baby highchair	Baby is in the highchair
Mommy eggnog	Mommy had her eggnog
Eve lunch	Eve is having lunch
Mommy sandwich	Mommy'll have a sandwich
Sat wall	He sat on the wall
Throw Daddy	Throw it to Daddy
Pick glove	Pick the glove up

(R. Brown & Bellugi, 1964, pp. 140-141).

Such typical expansions seem to constitute perfect examples of feedback. In fact, expansions constitute the one category of adult responses where the nature of the assistance to the child can be specified. R. Brown & Bellugi suggest how expansions may provide this assistance, particularly for the acquisition of grammar:

> By adding something to the words the child has just produced one confirms his response insofar as it is appropriate. In addition one takes him somewhat beyond that response but not greatly beyond it. One encodes additional meanings at a moment when he is most likely to be attending to the cues that can teach that meaning (1964, p. 143).

In the discussion of optimal sequencing of stimuli, I suggested that if such sequencing occurs in the language learning process it must occur fortuitously. Expansions, by their very nature, provide such sequencing. And the fascinating aspect of the process is that the sequencing of the parent's responses is done under the guidance of the child. For example, if the child says Dat Daddy shoe the parental expansion That's Daddy's shoe gives him information on the use of the copula and the possessive inflection. No one has suggested that parents expand with any conscious tutorial intention. It seems simply to be one spontaneous way of keeping the conversation with a young child going. But the happy result is a case of mutual feedback where each participant in a dynamic system guides and influences the other.

The discovery of this category of expansions makes possible a new attempt to separate the effects of exposure and contingent response. At first it seemed as if this would be possible even in natural observations. It might be instructive to compare the emergence in the child of grammatical constructions which the child hears in the adult's non-expanding speech with those appearing in the adult's expansions of the child's telegraphic utterances. According to R. Brown's data (unpublished memorandum, 1964), for his two subjects the order of emergence of some 40 different grammatical constructions can be well predicted (rank order correlations of about .80) by the frequencies with which the same 40 constructions are used by the mothers. But the constructions which were more often modeled were also the more often expanded. Therefore, only a carefully controlled experiment can attempt to separate the influence on the child's language development of these two aspects of his environment -- simple exposure to language and feedback as it occurs in its natural form of expansions.

Hypotheses

This research focuses on one question: what are the comparative effects on child language development of adult modeling of well-formed sentences and of adult expansions of the child's utterances? Since expansions are also models, the question may be phrased more precisely: do expansions, beyond their role as models, show additional power attributable to the contingent nature of their relationship to the child's speech?

Hypotheses which predict the outcome of such a comparison can be derived from either of two major theories of child language acquisition current today. The two theories may be given familiar names: empiricism and nativism. They differ on how the child gets started and how he proceeds.

According to the incumbent empiricist theory, children start by imitation.

> They imitate because it is a functional property of the nervous system, because they are reinforced for imitating by other humans, because imitation is secondarily reinforcing, and because very soon the behaviors involved have functional properties for them as instrumental acts (Jenkins & Palermo, 1964, p. 162).

Bandura & McDonald present evidence that imitation can aid social learning in two ways. It gets novel responses started when "there is no reliable eliciting stimulus apart from the cues provided by others as they perform the behavior (1963, p. 275), and it shortcuts the otherwise gradual approximations to the mature response.

Beyond imitation, language acquisition is seen as a concept formation task:

> I suggest that learning of inflectional and syntactical skills is akin to concept formation, and that its rate of occurence may well be governed by such variables as number of instances, amount of feedback, ratio of positive to negative instances, reinforcement contingencies, and all of the other variables pertinent to concept formation (Cofer, 1963, p. 198).

In terms of this theory, increased exposure to language would help the child by providing more models for imitation and more instances of the concepts to be learned, while expansions would additionally provide more feedback.

The challenging nativist theory has been revived by philosophers and linguists as a derivation from the transformational or generative model of language. Brief comments on acquisition by Chomsky (1957) and Chomsky & G. Miller (1963) have now been amplified by Katz (forthcoming) and McNeill (forthcoming). Katz discusses the general empiricism - nativism controversy over the role of experience in conceptual knowledge and uses the acquisition of language as a critical case to be explained; McNeill fits nativist theory to the detailed observations of child language now available.

Briefly, Katz and McNeill suggest that the child does not start speech with imitations but with language universals which are built into his own "language acquisition device." The child then goes through a process of theory construction, testing hypotheses derived from language universals against the sample of actual language to which he is exposed. In this way he learns the idiosyncratic features of his particular language.

> Thus the role of experience is primarily to provide the data against which predictions and thus hypotheses are judged. Experience serves not to provide the things to be copied by the mind, as on the empiricist's account, but to help eliminate false hypotheses about the rulesof a language (Katz, forthcoming).

The new nativists assign to experience the simple role of providing exposure to samples of a particular language. "Mere exposure for a remarkably short period is apparently all that is required for a normal child to develop the competence of a native speaker" (Chomsky & G. Miller, 1963, p. 276). While exposure may be all that is required, it is possible that experience can provide more powerful assistance in a way completely consistent with the nativist theory.

Let us assume that the child is engaged in "a process of implicit theory construction similar in character to theory construction in science but without the explicit intellectual operations of the latter" (Katz, forthcoming). What is important is that scientists do not rely solely on observations; they also make experiments.

> The aim of science is to break the code of nature. . . . The sciences, however, do not have to make do with the observations of nature as they come. They are able to ask questions of nature, to which she replies in the same code. That is, they can do experiments, and add the new results to the observations they already have (Bronowski, 1961, pp. 454, 457).

From exposure to models the child can make observations. But from expansions he can obtain immediate, direct and specific answers to his own experiments in breaking the code of his particular language community.

Though the importance of this theoretical controversy may lend interest to any results, the research reported here is in no way a test of the two theories. On the question of the relative assistance to the child provided by models and expansions, both theories predict that expansions should be more helpful. This prediction is embodied in the two hypotheses which this research has been designed to test:

(1) Children whose language is expanded or who merely hear more language spoken will show greater language growth than do children who receive neither treatment.

(2) Of the two treatments, expanding will be the more effective.

Chapter 2. Procedures

Briefly: Twelve children, ranging in age from 28-38 months, were randomly assigned to three treatment groups. Two tutors talked with the children in individual daily sessions. One group (expansion) received intensive and deliberate expansions. Another group (modeling) received quantitatively equal exposure to well-formed sentences that were not expansions. A third group (control) received no special treatment. Treatments extended over a three-month period. At the beginning, middle and end of the period the grammatical development of the twelve children was compared from test data and analyses of spontaneous speech samples.

These procedures will be described in detail under five headings: subjects, treatments, tape recordings, measures of language development and statistical analysis.

Subjects

The subjects were twelve children in a day-care center in Boston, Massachusetts. All of the children were Negro. Nine out of twelve were girls. At the time treatment began they ranged in age from 28-38 months.

Selection of children from a lower-class environment was related to both basic research and educational aspects of the experiment. An assumption underlying this study is that speech, a natural human capacity, needs optimal conditions for its fullest development. Just as one could not demonstrate the importance of vitamins with children already getting a balanced diet, so one cannot assess attempts to assist language development with children enjoying a rich verbal environment. One might obtain subjects from a barren institution such as an orphanage. But since this study was also planned to suggest positive application to the education of lower-class children, the sample was selected from that population.

Since it was clear from previous research (R. Brown & Bellugi, 1964; R. Brown & Fraser, 1964) that the age range needed was approximately 30-36 months, the first task was to locate a group of lower-class children under three years of age. Two ways of doing this were explored. One could establish an "hour-a-day nursery school" in a low-income housing project by interviewing families and inviting those children who fit certain criteria to become pupils in the special school. Preliminary efforts were made in this direction, but these were stopped when permission to conduct such a school on project property met with objections and delays from a politically appointed housing board. Alternatively, one could find children already assembled in a day-care center for working mothers. This seemingly easy procedure was complicated by a recent state health department ruling that "A child under three years of age shall be admitted to a day care service only upon written approval from the Massachusetts Department of Public Health."[a] To meet this requirement most schools have raised their minimum age to three. But after several days of telephone calls and visits I discovered that in the Negro community the ruling was not yet enforced.

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[a] From the Commonwealth of Massachusetts Department of Public Health Rules and Regulations for Day Care Services for Children, Section III, A, 1, filed with the Secretary of State on December 16, 1963.

At this point the wisdom of using Negro subjects had to be considered. Even were Negro tutors employed, I am white, and I did not want to withdraw from all contact with the children. Yet Pettigrew (1964) has summarized an accumulation of evidence that as early as the third year of life Negro children respond differently to Negro and white adults. Would the relationship of Negro children to white adults make it more difficult to obtain significant influence on language development and valid data for measuring the change? Would such a combination diminish the potential generality and hence the importance of any results obtained?

I decided to proceed in one of the Negro schools with white adults on the following rationale. The research involved not just testing but a continuing daily relation with the children over several months, with provision for an orientation period before the pretest data was obtained. All the subjects would be Negro and no Negro-white comparisons would be made or implied. The presence of a Negro control group meant that any pretest-posttest differences which could be due to greater familiarity of the Negro children with the white adults could not contaminate the results. There was no reason to think that any part of the treatment procedures would be differentially affected by any racial variable. Finally, current interest in the education of urban Negro children would enhance the importance of any results.[3]

Once this decision was reached, a particular school was selected which met several criteria: a low adult-child ratio, which meant little opportunity for stimulation from the school adults; the availability of two rooms where the treatments could be carried on; and tuition payable by the week rather than by the day, making it more likely that attendance would be regular.

I told the owner of the school that "some people from Harvard University are interested in trying out ideas about pre-school education and would like to work individually with some two-year-old children." No mention was made of any interest in language development. The owner readily gave permission, and two small rooms lined with cribs and cots used only at nap-time were made available. A monthly stipend was given to the owner, partly as reimbursement for expenses such as electricity, and partly as token of appreciation for her cooperation throughout the period of the study.[4]

The school has a daily attendance of 30-35 children from one to three years old. My impression is that in order to be enrolled the children have to be walking but not necessarily toilet-trained, and that at about age three they are transferred to a day-care center for older children under the same ownership. Adults at the school during this research included the owner who appeared in the morning to collect the monies and do some driving, one teacher, and a cook who helped with the children when she had time.

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[3] I am grateful to Dr. Thomas F. Pettigrew of Harvard University for consultation on this question.

[4] For reasons that will be obvious to the reader I am not identifying the school by name. But I do want to express gratitude to the owner and the staff for the warmth with which they accepted the tutors and myself.

On a typical morning about 90 children come and go through the school from 7-9:30 A.M. Of these about 40 are taken to the older school and 20 to the public kindergarten when they open. About 30 stay at the "baby school," as it is called by the older children. During this preliminary period the children sit on benches or on the floor while the TV is on. Later in the morning a few toys are taken down from high shelves. The TV is turned off and a phonograph is turned on, to remain going most of the morning, playing scratchy versions of nursery rhymes, Christmas carols or the Beatles. In general children sit or stand and get into remarkably little trouble. When it's sunny they are taken outside for an hour before lunch to ride on swings, slide or a merry-go-round, or fill some rusty cans with pebbles and leaves. If the weather is cold they spend part of the morning marching and dancing energetically, and often do the "Twist."

In selecting subjects from among the children at this school no attempt was made to obtain demographic information on the families or make any observations on child-parent interaction. Rather it was assumed that these children were by definition linguistically deprived just because they spent eight to ten hours a day in this environment. Here in microcosm were some aspects of slum life which have been suggested as responsible for language retardation: a low adult-child ratio, here 1:30; a generally high noise level--with babies crying, phonograph playing, and too many people per room; and pressure--however adaptive in such circumstances--to stay out of trouble, restrict one's activities, and obey the frequent command to "Shut your mouth."

With two tutors and three groups, the number of subjects had to be twelve or a multiple of twelve to meet the requirements of the experimental design. Twelve was selected as a compromise between the desire for a sample large enough to ensure conclusive results and an appreciation of the time needed for analysing protocols of each child's speech. The small sample also made it possible to go beyond statistical comparisons for a closer look at some of the processes involved in the acquisition of grammar.

The selection of twelve children was made on the basis of level of language development, age, talkativeness and sex. I wanted children who were putting two words together but not yet speaking in full sentences. On the one hand, a high incidence of one-word utterances would make it harder for the tutor to know what the expansion should be; on the other hand, the closer the utterance is to a full sentence, the less room there is left for expansion. Age had to be considered, since children at the same stage of language development but different ages might have very different learning rates. Talkativeness was important because if the child spoke little there would be less to expand, and it would be more difficult to obtain reliable test data. The ideal set of subjects would have been twelve children homogeneous with respect to these criteria and to sex as well.

Departures from this ideal had to be accepted, first in terms of sex. The original desire to have only boys or only girls was more in deference to the generally held belief in differential verbal development than to any substantial amount of recent confirming evidence. According to McCarthy (1954) girls develop language faster than boys. But in the most recent normative study Templin (1957) found smaller sex differences with the boys ahead at age three though not significantly so. Berko (1958) found no sex differences in ability to handle English morphology among children 4-7 years old. The current longitudinal studies of grammatical development have so far dealt with too few cases to permit any generalization about sex differences.

The presence of all female tutors suggested an additional argument for limiting the sample to one sex, preferably girls, although evidence on the relative effectiveness of same-sex and cross-sex models is mixed. According to Bandura, "The relative potency of male and female models for eliciting imitative responses may be a function of the extent to which the behavior in question is sex-typed" (1963, p. 105). But limitation to one sex proved impossible to arrange.

A majority of the two-year-olds at the school happened to be girls, perhaps partly because the more active boys were transferred to the older school earlier than the quieter girls. But only nine girls met the other criteria. Three boys were therefore selected. Ten other children who fell within the age range of those selected were rejected on various grounds: four were too silent, two showed symptoms of emotional disturbance, two were uttering only single words and two were linguistically too advanced. It should be emphasized that the study began and ended with the same twelve children.

The tutors and I observed the children, both in the regular playroom and in our tutoring rooms, for two weeks. Sets of matched trios were then formed. From $trio_1$ through $trio_2$ to $trio_3$ there was a decrease in both age and language ability, while $trio_4$ was younger but linguistically more advanced.

After a trio was formed the pretest recordings were made, and the three children then randomly assigned to one of the three treatment groups. Departure from random assignment was made only to guarantee that each of the three boys was in a different treatment group. Table 1 gives name, sex, age at the time of the pretest, group assignment and trio number for each of the twelve subjects. The combination of group initial in capital letter and trio number in subscript (e.g., E_1 or M_2 or C_4) will be used henceforth when a particular child is referred to by name.

Once the assignments had been made, the treatments were begun. For the first trio this happened the fourth week we were at the school, while for the fourth trio treatment didn't start until the eighth week. This staggered beginning, analogous to separate heats in a sports event, proved to be a very helpful administrative device. A detailed schedule is given in Table 2.

My contacts with the families of the children were limited to letters, calls and visits to find out a child's age or inquire about attendance. I explained my interest to the parents as I had explained it to the school owner, and again no mention was made of any special interest in language. These family contacts were distributed among the treatment groups--two in the expansion group, three in the modeling group, and three in the control group. It is assumed that they had no effect on the results.

TABLE 1

SUBJECTS

Name	Sex	Age[a]	Group assignment[b] and trio number[c]
Donessa	F	37	E_1
Karen	F	38	M_1
Angie	F	36	C_1
Ronnie	M	37	E_2
Pamela	F	33	M_2
Tina	F	36	C_2
Deedee	F	34	E_3
Derwin	M	32	M_3
Yvonne	F	33	C_3
Nancy	F	28	E_4
Lisa	F	29	M_4
George	M	33	C_4

[a] In months, as of the date of pretest

[b] By first initial of group: Expansion, Modeling or Control

[c] In subscript

TABLE 2

SCHEDULE

Week	Test tapes made	Treatment tapes made
Sept. 28	[a]	
Oct. 5	[a]	
Oct. 12	Trio$_1$ pretest	
Oct. 19	Trio$_2$ pretest	Trio$_1$
Oct. 26		Trio$_2$
Nov. 2	Trio$_3$ pretest	Trio$_1$
Nov. 9	Trio$_4$ pretest	Trio$_2$ and $_3$
Nov. 16		Trio$_1$ and $_4$
Nov. 23	[b]	
Nov. 30	Trio$_1$ midtest	Trio$_2$ and $_3$
Dec. 7	Trio$_2$ midtest	Trio$_1$ and $_4$
Dec. 14		Trio$_2$ and $_3$
Dec. 21	Trio$_3$ midtest	Trio$_1$ and $_4$
Dec. 28	[c]	
Jan. 4	Trio$_4$ midtest	Trio$_2$ and $_3$
Jan. 11		Trio$_1$ and $_4$
Jan. 18	Trio$_1$ posttest	Trio$_2$ and $_3$
Jan. 25	Trio$_2$ posttest	Trio$_4$
Feb. 1		Trio$_3$
Feb. 8	Trio$_3$ posttest	Trio$_4$
Feb. 15	Trio$_4$ posttest	

[a] Two weeks of orientation period

[b] Not counted because Thanksgiving vacation left only three treatment days

[c] Two weeks of Christmas vacation counted as only one week because there were only three treatment days each week

Treatments

Two young women were engaged as tutors.[5] They were chosen from more than a dozen applicants on the basis of their personal warmth, clear speech and some previous experience with children. In the following pages a feminine pronoun refersto a tutor and a masculine pronoun to a child unless the referent is a particular little girl.

I explained the general purpose of the research to the tutors but I did not say which treatment was favored nor what the measures of language development would be. In the initial interview and in weekly in-service training meetings I emphasized to the tutors that the critical factor in the success of the research was their ability to be warm and spontaneous with the children while controlling their verbal behavior in structured ways, and that the research could give important information--whatever the outcome--as long as they were able to separate the modeling and expanding functions of their speech.

The tutors worked in separate rooms, each seeing four children every morning. Tutor A regularly saw the children in trios 1 and 4 while Tutor B saw the children in trios 2 and 3. Exceptions to this pattern occurred when a child who had been absent could receive make-up time more quickly from the other tutor, or when a tutor was absent and I served as the substitute. No formal rotation of rooms or times of day was attempted, but that effect was achieved. Only one of the rooms was used for tape recording, and the agenda was arranged each day to accomodate the recording schedule and the needs for makeup time.

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[5] Mrs. Christina Gebhardt and Mrs. Edda Dyson, both faculty wives at a nearby preparatory school.

Each child in the expanding and modeling groups was seen every school day for twelve weeks, exclusive of the orientation and pretest period. All time lost by illness was made up. The length of the daily treatment session for the two groups was equated for the number of adult utterances and set at 40 minutes for expansion group and 30 minutes for modeling group. This time difference is explained below. Following is a typical morning schedule for Tutor B:

8:30-8:40 Set up the room - moving cots, unpacking toys
8:40-9:20 Expansion session with Ronnie (E_2)
9:25-9:55 Modeling session with Derwin (M_3)
9:55-10:05 Break for a cigarette
10:05-10:35 Modeling session with Pamela (M_2)
10:40-11:20 Expansion session with Deedee (E_3)
11:20-11:30 Put materials away and rearrange room for naps

The two treatment rooms were equipped with duplicate materials.[6] While trying out materials during the orientation period, we discovered that they could be divided into three categories according to their usefulness in eliciting conversation from the children. The Montessori-type materials, represented by a color cone and a simple geometrical puzzle, were useful during the first few days when the children were getting accustomed to coming with us into the treatment rooms. The shyest child could start work and gain immediate success without need for interaction with the strange adult. In the special way which is familiar to adults from jigsaw puzzles, directions for using these materials inhere in the materials themselves. But because the children tended to sit for long periods and take them apart and put them together again in comparative silence, we used these toys less as the children felt more at ease.

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[6] The materials included a color cone, puzzle, Raggedy Ann dolls, a stuffed dog, a family of 6" bendable rubber dolls, a telephone, a tea set, wash basin with sponges and a towel, pots and a cardboard stove, plasticene, tinker-toys, an 8" x 10" mirror, a pocketbook with comb, toy mirror, beads and a scarf, and books.

If we consider Montessori materials structured in both what they are and what one can do with them, the opposite extreme is represented by plasticene and blocks. Here there is so little built-in structure that the child's imagination is virtually unconstrained. Verbalization is encouraged, but the possible topics of conversation are so numerous that it becomes difficult for the adult to understand and respond to the child. The child can pretend that plasticene is almost anything, and his simple shapeless lump provides few clues to the adult who is trying to understand his speech. More reliance has to be placed on information conveyed through speech itself, and if the child does not enunciate clearly it can be very hard for the adult to guess at what he is trying to say. This was particularly true during the first few weeks with Ronnie (E_2).

In the middle ground were the dolls, the cars, and the housekeeping and dress-up materials. Here the nature of the materials was fixed, but the children were free to use them in a variety of ways. During the long periods of preparing food and feeding the dolls, or giving the dolls rides in the cars, talk was plentiful and the topic of conversation usually obvious. It is interesting, though perhaps not significant, that these are the kinds of materials that parents and children are likely to use and talk about at home.

Books were available in both treatment groups but were used in different ways. In the expanding sessions they were used as pictures to be talked about, while in the modeling sessions one book was read verbatim each day. Neither treatment required the use of books, but they were included for several reasons. In an important precursor of this research, Irwin (1960) used reading to increase the amount of language children heard. As will be explained below, modeling good English without expanding is not easy for the adult, and reading one book each day lessened the strain. And at any future time a comparison of the grammar of adult speech and of picture-book texts could be made.

The books used were selected for both pictures and text. I looked for pictures that were simple and uncluttered and that portrayed actions rather than the static objects of so many ABC books. I looked for texts that had simple well-formed sentences and that did not depend for their comprehension on the child following a continuous plot. A list of the books used is given in Appendix A.

The use of books had two side effects, one on the physical contact between tutor and child and another on the daily time for each treatment. Normally the children played on the floor, on a rug provided for the purpose, and the tutors sat with them on the floor or on low chairs. Either way, the tutor was physically on the same level as the child; she never stood and talked down from a height (as the teacher in the day-care room always did). But reading to the child necessarily brought about a special and quite different physical relationship. In the traditional reading position, which both tutors spontaneously adopted, the child sits on the adult's lap. Both face the same direction so they can see the pages together. Inevitably there is formed a close physical contact with possible strong positive valence. Further, the adult speaks almost into the child's ear. Thus the child can hear with unusual clarity, but he cannot watch the adult as she speaks as he can when they face each other over the toys.

We do not know what this unique combination of features adds to or subtracts from the impact of the language heard. Yet it seemed important not to confound the formal differences between the two treatments with such a disparity in physical contact. Therefore, the tutors were asked to adopt the same position when looking at books with the children in the expansion group.

The two treatments had to be equated in terms of the number of adult utterances. I made numerous counts of utterances per minute, both by tally marks on the spot as I sat unobtrusively in the corner and by computing the per minute average of adult utterances made during the eight-minute segments of the treatment sessions which were taped bi-weekly. I had expected that when relieved of the necessity of expanding the tutors would speak more times per minute and might even come unhappily close to a monologue. This did not happen. All the data pointed to a judgment that for these adults talking to these children there was a stable rate of speech. That rate varied from time to time, but the variations were not dependent on whether the speech was contingent on the child or not.

It did turn out, however, that during the ten-minute period of each modeling session which included reading the utterance rate per minute approximately doubled. That is why time for the modeling sessions was fixed at ten minutes less than time for the expansion sessions. Thirty and 40 minutes respectively were chosen as fitting in best with the overall morning schedule and with the interest span of the children.

The purpose of the control group was to serve as a base-line against which to measure change in language development beyond that due to maturation and other uncontrolled variables. Once the group assignments had been made the control-group children were not included in the daily schedule but remained in the day-care situation. While the letter of the law on control groups would dictate equal time for adult attention, there was no way to provide this. If the children came into the treatment room the tutor had two alternatives: to talk or to be silent. If she talked she would be decreasing the difference between the control and treatment groups and making the base-line artificially high. If she remained silent she could be rightfully accused of subjecting the child to further verbal deprivation and making the base-line artificially low. As a compromise arrangement, we occasionally brought the control group children into the treatment rooms in pairs. In this way they remained familiar with us and our materials and could talk to each other.

The verbal content of the expansion and modeling treatments will now be described in more detail.

Expansion Treatment

To expand a child's utterance the adult follows these directions: "Retain the words given in the order given and add the functors that will result in a well-formed simple sentence that is appropriate to the circumstances" (R. Brown & Bellugi, 1964, p. 142). In more colloquial terms, "Using his words, build up what the child says to what you think he means."

In its purest form an expansion session would have two complementary characteristics: every utterance spoken by the child would be expanded by the adult, and every utterance spoken by the adult would be an expansion of the preceding utterance of the child. This ideal can be approximated but not attained. The child's utterances may be unintelligible, or they may follow each other so rapidly that the adult has no time for expansions. The adult, in turn, frequently has to prime the conversation with non-expanding utterances when non-verbal behavior fails to attract the child's attention and elicit speech.

Appendix B(1) gives a transcription of a few minutes of one expansion session. In this transcription, as in all other examples, the child's speech is on the left and the adult speech on the right.

During the course of the treatment sessions the tutors and I identified recurring problems and in our weekly meetings we worked out rules for handling them.

(1) If the child utters a telegraphic reduction of the adult's utterance, the adult should respond with an appropriate expansion; e.g.,

	Is that a bad hand?
Bad hand	
	It's a bad hand.

If the child again imitates the adult it may be helpful to repeat the expansion, or the adult can take the initiative in changing the conversation.

(2) If the child enumerates names of objects without trying to express any action or relationship, the adult should try to do or say something to elicit an utterance that is a construction rather than just a name. Questions can be framed that will increase the probability of telegraphic versions of certain constructions. When a block tower falls down, What happened? may elicit a past tense of the verb. When ownership is relevant, Whose hat is that? may elicit a possessive inflection.

(3) If a child says Make a ball the adult has to decide whether a declarative sentence or an imperative is intended. While the intention is not always apparent on the tape recordings, there is seldom ambiguity in the actual situation. If the child is using a declarative, the adult can ask Are you making a ball? If it is an imperative, the adult should repeat the direction and then respond: Make a ball? All right, I'll make a ball. In both cases what is important is not to leave the verb in its unmodified form.

(4) If the child asks a question, the adult should repeat the question before answering it.

Dat baby ball?	
	Is that the baby's ball? Yes, that's the baby's ball.

(5) If the child is talking to a third party, such as a doll, the adult should play the same role and frame her expansion in the same form.

You go your own bed	
	Yes, you go in your own bed.

(6) If the child says something with which the adult wants to disagree, the adult should expand the child's utterance first.

No he not

No, he's not?
Yes, I think he is.

These procedures describe the patterns which the tutors tried to maintain. But we all recognized that in the spontaneous give-and-take of adult-child conversations opportunities were sometimes missed.

One final and very important observation concerns the tone of voice with which an expansion is uttered. The difference between a parent's expansion and a teacher's correction may be only in the tone of voice and perhaps in an optional initial yes or no. Yet that difference may have great meaning for the child. Suppose that while looking at a book the child has said He fall down. Let the reader say to himself the following alternative responses:

Expansion: Yes, he fell down.
Correction: No, he fell down.

The warm, confirming quality of the expansion contrasts with the critical and impatient manner of the correction. The expansion, in substance and in tone, focuses on how much the child has already achieved, while still pointing the direction of further growth; the correction stresses the gap still remaining between where the child is and where he is supposed to arrive. Occasionally, in their understandable urge to advance development, the tutors would veer toward the correction. But they tried hard and generally succeeded in providing true expansions.

Modeling Treatment

A model could be any well-formed utterance. Because this research required the separation of those adult utterances which are expansions of the previous child utterance from those which are not, I will limit the definition to any well-formed sentence which does not contain the content words of the previous child utterance. In a pure modeling session all of the adult utterances would be of this type. Appendix B(2) gives a transcription of a few minutes of one modeling session. Here are examples of child utterances with an appropriate adult response:

I got apples	Do you like them?
His name Tony	That's right.
Das a rabbit	Yes, he goes hop, hop, hop.
We got some more	There's a lot in there.

Despite the seeming ease of these examples, it turns out to be difficult to conduct a treatment that provides exposure to well-formed sentences without providing expansions as well. Reading to a child accomplished this, and in the early stages of planning this research I considered making reading the primary activity during modeling sessions. But even if the children were able to listen to several stories each day, which is doubtful, reading and expanding differ in too many ways--most importantly in the passive versus active role of the child. Therefore, I decided to use books as described above. But in both treatments the most important medium for providing language was conversation.

What makes modeling without expanding difficult is that a child's telegraphic utterance seems to be a stimulus to which the attentive adult responds spontaneously with an expansion. The tutors could and did suppress this response deliberately, but the process remained unnatural. They sought to retain the warm, affirming quality of expansions by saying Yes and That's right, but a feeling of disinterest was sometimes conveyed. They tried to maintain the same topic of conversation while varying the morphemes in the utterance, but the discourse agreement was sometimes tenuous. And evident only on the tape recordings is the tell-tale pause when the listener can almost "hear" the automatic expansion being suppressed and an alternative utterance improvised. Deliberate non-expansion can be recommended only as an experimental technique.

Tape Recordings

Two sets of tape recordings were made. One set, the test tapes, consisted of pretest, midtest and posttest for each of the twelve children. These were analyzed in ways described in the next section to yield the measures of language development. The other set, the treatment tapes, consisted of eight-minute segments of the treatment sessions. The transcriptions given in Appendix B come from these tapes. After a general description of the setting for all tape recording, the test tapes and treatment tapes will be described in more detail.

Recording was done in only one of the two treatment rooms. This room was located at the rear of the school building, farther from the regular play area and thus quieter. The room was small and completely lined with five cribs, one of which sometimes held a sleeping baby whom we ignored. Because the available space was small the recording microphone was always close to the child. Thus a positive result of working in a small space was that with low recording volume an adequate signal was obtained to the exclusion of much of the loud noise from beyond the door. All recording was done on a Wollensak monaural recorder, Model 1600, using the microphone supplied with that machine and Scotch High Output Tape, type 120.

No attempt was made to hide either the recorder or the microphone. The children were told that both were "my toys," and they seemed to accept it as quite reasonable that I sat and played with my toys, pushing buttons on one (which occasionally made funny noises) and moving the other one around on the floor. The euphemistic name hopefully precluded any talk of microphones at home and may have contributed to the easy acceptance of the recording situation. Only one child, Derwin (M_3), seemed inhibited by the microphone. He was encouraged to feel it and hold it, and this seemed to give him the needed reassurance to ignore it thereafter. The school adults must have noticed the recorder being carried into the building nearly every day, and occasionally one of them came into the recording room to get diapers out of the closet or put a sleepy baby to bed. But they never asked about the recorder, and we never volunteered discussion of its purpose. Parents never came to school for any reason, so presumably they were not aware that recording took place.

Test tapes of each child were made at three times: a pretest at the end of the orientation period, a midtest during the sixth treatment week, and a posttest at the end of the twelfth treatment week. The reader is referred back to Table 2 for the schedule.

Each test tape consisted partly of spontaneous conversation between the child and his tutor and partly of a sentence imitation test which I administered. In the conversation the tutor was asked to talk in the same manner with all the children, neither deliberately expanding nor deliberately suppressing expansions. I sat in my usual corner near the recorder, moving the microphone to keep it close to the child and making telegraphic notes of the child's speech. Previous experience had shown how much such notes aid later transcription.

For the controlled tests the child was invited to bring up a small chair facing mine and "Look at my big book." During the test the tutor took notes. For all tests for all children there was the same small chair and the same large book. This very structured situation was introduced during the orientation period. It proved effective as a technique for facilitating research with young children. On the one hand, I trained the children to behave in a certain way, to repeat what I said, so that I could use the resulting behavior for measuring their language development. This training was aided by the almost ritual consistency of the setting in which the behavior was requested. On the other hand, it would have been unfortunate if this imitative behavior had generalized beyond the test situation. The probability of this occurring was lessened by having the stimuli, or cues, for the spontaneous conversation with the tutor and the test with me as distinct as possible.

The length of the test tapes--spontaneous speech and test responses combined--varied with the talkativeness of the children from a low of 40 minutes for Donessa (E_1) and Angie (C_1) to a high of 120 minutes for Deedee (E_3).

The test tapes were transcribed by a part-time secretary[7] working at home with another Wollensak recorder. Because the secretary had had no previous experience with this work, two training sessions were arranged with a linguist.[8] First, the secretary transcribed a section of a tape of Sarah, one of R. Brown's subjects, and went over the transcription with the linguist. The secretary agreed with the linguist on 106 out of 120 running morphemes, or 88% of the time. The linguist went over each discrepancy and explained carefully what to listen for. Then the secretary transcribed one of the pretest tapes from this research and again the transcription was checked. This time out of 235 running morphemes there was agreement on 215, or 91%. This procedure for determining the reliability of the transcriptions is similar to the computation of a coefficient of inter-transcriber agreement. But the result of .91 represents the degree of agreement, not between any two transcribers chosen at random, but between one such person and a highly competent linguist.

Of equal importance with the secretary's training was her ignorance of the treatment assignment of the children. Bias would almost inevitably intrude if someone with that information made the transcriptions. Deciding whether a child has added ing to a verb or a plural s to a noun is far from a straightforward matter. The best trained secretary will make mistakes, but at least her errors can be assumed to be scattered in random fashion among the transcriptions.

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[7] Mrs. Elaine Shefer, wife of a Harvard University graduate student.

[8] I am indebted to Dr. Gloria Cooper, a linguist associated with Dr. Roger Brown's Language Acquisition Project, for her time and assistance.

The secretary was aided by the notes written at the time the recordings were made. These notes were in telegraphic form and merely gave information on content words which could be identified more easily in the situation. Determination of the rest of the utterance remained with the secretary.

The transcriptions were later reduced, in ways described in the following section, to a corpus of utterances which were subjected to intensive analysis. The secretary transcribed the tapes as they were made. But I did not select the corpus nor do any analysis until the treatments were finished.

Independent of these test tapes were the treatment tapes. An eight-minute sample of the treatment session for each child in the expansion and modeling groups was taken every other week, for a total of six times in three months. See Table 2 for the timing of these tapes in relation to the test tapes. Since this material was not to be used for hypothesis testing I did these transcriptions myself. They were used in the in-service meetings with the tutors, as a check on the amount of language being supplied in the two situations, and more generally for obtaining a better understanding of the treatments.

Measures

Introduction

The most difficult part of this research was establishing valid and reliable dependent variables, measures of a child's language development which together constitute an operational definition of that development. Three general aspects of the measurement procedures deserve preliminary comment: tests of speech as compared with analysis of spontaneous speech; selection from the transcriptions of a particular corpus of speech to be analysed; and the nature of developmental scales.

Tests versus analysis of spontaneous speech. Theoretically, there is a gap of unknown size between what a child can do and what he actually does. When we speak of the acquisition of grammar we refer to the increasingly complex structures which "the person [in this case the child] has succeeded in mastering and internalizing, whether or not he utilizes them in practice, without interference from the many other ... factors which play a role in actual behavior" (Chomsky, 1964, p. 36). There is general agreement that linguistic competence in the sense of these structures is not the same thing as linguistic performance in the sense of overt verbal behavior, and that drawing conclusions about the child's development of linguistic competence from an analysis of samples of spontaneous speech raises serious questions. (See McNeill, forthcoming, for further discussion of this issue).

But in trying to study the acquisition of grammar by more direct experimental techniques we confront difficulties in working with children at the very young age when this process occurs. The solution of the theoretical issue is thus hindered by the practical problems of working with two-year-old subjects. Specific examples can be cited. Berko (1958) gave her ingenious test of knowledge of English morphology to four-year-old children, but I was unable to obtain usable results on that test with children under three. Siever's (1955) test of psycholinguistic growth includes three subtests--repeating grammatical nonsense, for example--that could have been used in my research. But on these particular subtests Siever's two-year-old subjects generally did not respond. Such difficulties can be epitomized by the following story about two-year-old Adam:

> Another week we noticed that Adam would sometimes pluralize nouns when they should have been pluralized and sometimes not. We wondered if he could make grammatical judgments about the plural, if he could distinguish a correct form from an incorrect form. "Adam," we asked, "which is right, 'two shoes' or 'two shoe'?" His answer on that occasion, produced with explosive enthusiasm, was "Pop goes the weasel!" (R. Brown & Bellugi, 1964, p. 135).

Therefore we have to rely heavily on the analysis of samples of spontaneous speech. And because such analysis requires the time to make, transcribe and code many hours of tape recordings, the number of subjects is kept small, and the helpful properties of statistical aggregates are accordingly unavailable to the researcher.

One experimental situation to which even a two-year-old can be trained to respond is a sentence imitation test. Such a test was used in this research. The other five dependent variables are measures of certain aspects of spontaneous speech. They are: mean length of utterance, noun phrase index, verb complexity index, copula index, and sentence-type index. It cannot be emphasized too strongly that the overriding criterion on which all measurement decisions were based was the desire to separate out the "figure" of developmental change from the "ground" of all other influences--situational, interpersonal, emotional, etc.--which affect the child's speech at any given moment. The test of the two hypotheses in this research rests on the degree to which such a "figure-ground" separation has been achieved.

Selection of a corpus. The corpus of utterances to be analysed was selected from the secretary's transcriptions of the test tape recordings and comprised all utterances which met several criteria:

(1) I used only completely intelligible utterances, so that the measures of grammatical development would be minimally affected by the clarity of the child's enunciation.

(2) I excluded those utterances which were either an exact imitation or a telegraphic reduction of the preceding utterance of an adult. Ervin concludes from a study of five children that "imitations under the optimal conditions, those of immediate recall, are not grammatically progressive" (1964, p. 172). But it seemed safer for my purposes to exclude these most obvious imitations, so as to prevent possible influence on the measures of any differential dependency on adult speech among the twelve subjects.

(3) A child's exact repetition of his own preceding utterance was also excluded because such repetitions often seemed more a chanted accompaniment to play than speech intended for communication.

(4) Non-sentential expressions were excluded, whether they appeared alone or as additions to a structured utterance. The

presence of these expressions is highly influenced by situational factors rather than by grammatical development. Carroll (1964, p. 24) suggests four categories of such expressions; I have added two more. The following are examples of material excluded.

Greetings: *Hi*, all vocatives.
Calls and other attention-getters: *Hey!*
Exclamations: *Uh-oh!* *Oops!* *Jeepers!* *Ow!*
Non-sentential responses to the adult: *Yeah*, *No*, *O.K.*, and all wordless intonation patterns, including Derwin's (M_3) hummed substitutions for *I don't know.*
Sound effects: *Meow*, *Choo-choo*.
Singing, counting or reciting the ABC's.

If any of these expressions appeared as part of a structured utterance, rather than merely as additions to it, they were retained. So, for example, *No play no ball*, *See choo-choo train* or *Mommy say 'Hi'* were kept as spoken.

(5) A repetition or a correction within an utterance was excluded if, and only if, it was accompanied by a pause. As Winitz says, such a repetition was "not considered indicative of linguistic maturity and would substantially add to the length of the uttered response" (1959, p. 386). Loban termed these repetitions and false starts "mazes" (1963, p. 8), and excluded them from his data for similar reasons. The pause is the critical signal. In *Dat (his) - Andy's hat*, *his* was not included in any measure. *Mama drink it coffee*, however, contained no pause and the utterance was kept as spoken.

The corpus of utterances meeting these criteria varied in size for the three tests of the twelve children from a low of 111 utterances in Pamela's (M_2) pretest to a high of 409 utterances in Derwin's (M_3)

posttest. In order to obtain the maximum reliability on each measure for each child, differences in the size of the corpus were ignored. This is admittedly an unorthodox procedure. Tradition dictates that measures of utterance length and complexity should be computed on a predetermined number of utterances, almost invariably 50. But recent studies raise questions about this widespread practice. Minifie, Darley & Sherman concluded from a study of the temporal reliability of the mean length of 50 utterances of five- and eight-year-old children that a child might be placed "as much as two years ahead or two years behind his age level . . . even though he may be operating at about the average for his age level" (1963, p. 146). In an earlier study Darley & Moll found that structural complexity measures based on 50 utterances were even less reliable, "possibly because the structural complexity of a child's speech is a more variable phenomenon from response to response than is length of response" (1960, p. 172).

Assuming that variations in the size of the N used in computing each measure for each child would affect only the reliability of the measure, I saw no need to depress the reliability unnecessarily by requiring the same N. Using as many utterances as are available results in the highest possible individual reliability rather than only the highest common one. When tables of individual scores on separate measures are presented the N on which each score was computed is given.

Developmental scales. In Chapter 1 I stated the belief that current research will eventually lead to the discovery of a developmental sequence of language acquisition common to all children learning a particular language. Developmental scales can then be established and children's progress can be measured and compared. As Carroll points out, "such developmental scales would probably be more meaningful than such indices of language development as mean sentence length" (1961, p. 334). Such scales have not yet been established, much less standardized on any large sample of children. But the requirements of this study demanded ways of measuring developmental change in finer detail than mean length of response can give. Therefore scales were devised, largely on the basis of unpublished data available from the work of R. Brown & Bellugi, and weighted numbers were then assigned to points on those scales.

The grammatical structure of child speech can be scaled along at least three dimensions. First, there is the sequence of emergence. For example, we know that children use unmodified verbs before they use auxiliaries, and a weighted index would therefore assign more points to I'll go than to I put. In fact, if our understanding were complete, the criterion of sequence of emergence alone would suffice, because to the extent that other criteria are relevant they would influence that sequence.

Until we have a more comprehensive understanding of the sequence with which grammatical structures emerge, we can use the objective characteristic of structural complexity. Complexity undoubtedly influences the sequence of emergence but is not in one-to-one correspondence with it. Where the developmental sequence of emergence is quite clear, that criterion should take precedence. Where it is not clear, the criterion of complexity can serve as a tentative approximation. Two examples from the scales used in this research may clarify this contrast.

R. Brown & Bellugi (1964) have studied the development of the noun phrase in two children. They found that in the first stage any modifier could be used with any noun. When the differentiation process began, articles could be separated out of the class of modifiers. The children said A blue flower but not Blue a flower. Only later did the children use two modifiers other than articles before a noun (My blue flower). Therefore on a weighted index Flower, Nice flower, A blue flower and My blue flower could be scored from 1 to 4 respectively. There is no objective difference in complexity which would dictate this separation of articles from other modifiers. A blue flower and My blue flower each contain three units in a common pattern. Yet the developmental sequence is clear.

Verb forms present a contrast case. The sequence I drop, I dropping, I'm dropping represents both increasing complexity and sequence of emergence, and the forms may accordingly be scored 1, 2 and 3 respectively. But what of the past tense dropped? On the basis of complexity it should be grouped with dropping as a verb plus one additional element, but its period of emergence is definitely later. If we knew exactly when it appeared in relation to other forms, it could be scored accordingly. Since we do not as yet have this degree of understanding the decision has to be made on grounds of complexity. Dropped thus receives 2 points.

A third possible criterion is correctness. I did not deliberately apply this criterion. A trees and a coffee were each given full credit on the noun phrase index. But considerations of correctness did intrude. Sometimes incorrectness left the meaning ambiguous. If the child said *Her go upstairs*, it was clear that the child was using *her*--albeit incorrectly--in the subject position. But if he said *He wet him bed*, it was not clear whether *him* was being used as a possessive pronoun. Hence, in the interest of uniform if arbitrary application of rules, possessive pronouns were only counted in the noun phrase index when the correct forms were used.

A child was also penalized in scoring if the categories being used simply could not include his utterance. The categories in the noun phrase scale described above do not allow for modifier plus article plus noun. Therefore the noun phrase in *Stupid the daddy fall down* could be credited only as *the daddy*, for a score of 2.

While this particular error may be a feature of one child's idiolect, consideration must also be given to differences between the dialect on which the scale was developed and the dialect to which it is being applied. As an example of dialect differences, the children in this study often used an auxiliary with an unmodified verb, as in *He's go* or *I'm put*. These patterns had not been anticipated, since they had not appeared in R. Brown & Bellugi's data. Strictly on a criterion of complexity, *I'm put* would be counted as 2 verb elements, along with the more familiar *he going* or *I putting*.

I have suggested that ideally a child's language development should be evaluated in terms of his progress toward the norms for his particular speech community. I must admit that the scales used in this research were developed from data collected from two children of graduate-student parents, yet the scales were applied to working-class subjects. My reliance on complexity more than on developmental sequence as a criterion for evaluation helped make such a transfer possible. A scale based on complexity which accepts alternate forms of that complexity can be applied cross-culturally more appropriately than a scale based on the otherwise ideal criterion of sequence of emergence. The latter would be more likely to penalize departures from a preconceived norm.

Dialect differences made it impossible to measure the use of negation. As will be explained below, I decided to exclude negative verbs (I can't do it) and negatively modified nouns (No water) from the noun phrase index. Comparison of the effects of expansions and models on an entire grammatical system such as negation would have been an interesting part of this research. A possible basis for such an analysis has been provided by Bellugi's (forthcoming) study of the development of negation in two children.

Bellugi's scale is based on the sequence of emergence of particular negative forms. The sequence she describes includes the following patterns:

Stage 1: Negative element plus sentence (No drop mitten);
Stage 2: Negative imperatives (Don't do that), and demonstrative pronoun plus negative element plus noun (That no Mommy);
Stage 3: Noun phrase plus negative plus verb with ing (I not crying);
Stage 4: An approximation of adult forms.

It is an elegant scheme.

But many of the utterances of the subjects in my study could not be placed on Bellugi's scale. First, the frequent use of got and ain't got produced a construction where the negation appeared after the verb (I got no crayons). Second, multiple negatives (I not kiss no people) were more frequent and seemed to appear at earlier stages than in Bellugi's data.

In the end I gave up the attempt to do this analysis. But the problems which arose are important because they probably indicate problems that will be encountered frequently as work toward the establishment and use of developmental scales proceeds.

Each of the six measures of language development can now be described individually and in detail. For each I will give the rationale for its use and the rule by which it was applied. These rules may seem unnecessarily complicated or restrictive. But because I was doing the analysis in full knowledge of the treatment assignment of the children, it was essential that the rules leave no room for uncertainty at the moment of assigning a number to the particular utterance of a particular child.

Sentence Imitation Test

A test of children's ability to repeat sentences can be used as a dependent variable in this study because of the close relationship which has been found to exist between what a child can repeat and what he produces spontaneously. The exact relationship is a complicated one, depending on the age of the child, the length and complexity of the sentence he is asked to repeat, and the way in which the repetition is scored. (See experimental investigations by Fraser, Bellugi & R. Brown, 1963; Menyuk, 1963; Brown & Fraser, 1964. See discussion by Slobin, 1964; McNeill, forthcoming). But it seemed reasonable to believe that if either expanding or modeling facilitated the child's acquisition of grammar, one result would be an increased ability to repeat sentences when asked to do so.

A set of 14 sentences with the following characteristics was composed:

(1) The length of the sentences varies from 4 to 6 morphemes, with an average of 5.0 morphemes, or slightly more than the average length of the children's spontaneous utterances.

(2) Complexity is concentrated primarily in the verbs, for reasons which will be explained in discussion of the verb complexity index.

(3) Questions were avoided, because children are more apt to answer them than to repeat them.

(4) Each word should be familiar to the children, and the meaning of the entire sentence credible.

(5) The sequence of sounds must make the sentence both easy to say and easy to score without ambiguity.

With the benefit of hindsight I can suggest a characteristic which should have been considered but wasn't. The most common types of errors should be anticipated, so that a sentence would be rejected if the correct response (eaten) is not readily distinguishable from a likely error (eating).

Following are the 14 sentences which were used:

1. We're sitting down.
2. Mother dropped a spoon.
3. They won't play.
4. She can bring that apple.
5. It wasn't raining.
6. He wants to jump.
7. This train goes fast.
8. They don't have to run.
9. Some crayons are broken.
10. The baby felt sick.
11. Her shoe isn't tied.
12. Let me help you.
13. We've eaten supper.
14. His hair had been cut.

Children were trained for the repetition task with the very specific and consistent situational cues described earlier. During the orientation period I asked them to repeat routines like Hello and Peek-a-boo. The test was administered as part of the pre- and posttest recording sessions, one-half of the test on each of two days. It was not included in the midtest to minimize practice effects.

The child's score was the mean number of morphemes repeated correctly. Scores ranged from 2.36 (Deedee [E_3] pretest) to 4.86 (Karen [M_1] posttest) out of a possible 5.0.

Mean Length of Utterance

Mean length of utterance has been the single most widely used measure of language development (McCarthy, 1954). A global and summary kind of measure, its validity rests on the widespread finding that it increases with age, and on more recent important discoveries by R. Brown & Fraser (1964) and Bellugi (forthcoming) of a close correspondence between mean length and the emergence of specific grammatical features.

> We have checked all the records for progressive constructions (e.g., "I am going to town"). Without exception, children whose mean utterance length is below 3.2 form this construction by omitting the forms of the verb to be (e.g., I going"). We have checked sentences in which the verb would, for an adult, ordinarily require such a model auxiliary as will or can (e.g., I will park the car"). Children whose mean utterance length is below 3.5 invariably form these sentences by omitting models ("I park the car" or "I go outside" or "I make a tower"). In general, it appears that children whose speech is not yet English are using grammars which are systematic derivatives of adult grammar and that the particular features of the derivative grammar are predictable from the mean length of utterance (R. Brown & Fraser, 1964, p. 74).

Bellugi obtained comparable results in her study of the development of negation in two children. The four stages which she identified appeared when the children were at the same developmental level as measured by mean utterance length.

It should be stressed that in both the above studies mean length of utterance was computed in morphemes, not words. This is a sharp departure from previous normative studies, up to and including Templin (1957), in which the unit was the word. Morphemes have been used in this research.

Computing the mean length of utterance in morphemes requires prior decisions about what is an utterance and what is a morpheme. Determining the boundaries of an utterance has proven to be no problem. As R. Brown & Fraser remark, "the usual criteria of either a prolonged pause or a shift of speakers worked very well" (1964, p. 52). But determining what is a morpheme is exceedingly difficult and requires literally dozens of arbitrary decisions. While it is impossible to list all the decisions, I will discuss the problem briefly and illustrate what I did.

A morpheme is not a word. "Word divisions are part of our spelling conventions" (Gleason, 1961, p. 43). A word may include more than one morpheme (e.g., something or going); conversely, more than one word may be combined into a single morpheme, as a proper name like Santa Claus undoubtedly is to children. Morphemes can be divided into free morphemes like go and red, which can appear alone, and bound morphemes like ing and ly which never appear alone.

The problem of determining what is a morpheme is difficult because morphemes are defined as "the smallest units of structure which embody grammatical or lexical meanings" (Carroll, 1959, p. 24), and meaning is relative to the individual. In the study of child language this relativity to the individual has to be taken into special account. In the case of free morphemes as in something, we should know whether some and thing are also used separately by the child. In the case of bound morphemes such as the plural suffix s, we should consider whether its use is spontaneous or imitative, whether the child uses the singular form as well as the plural, whether the child in fact recognizes a contrast in meaning between the two forms, and whether the suffix can be added productively to new nouns (Ervin & W.Miller, 1963, p. 123).

While it might be possible to obtain all this information in a longitudinal study, it was not possible in the kind of snapshot view given in this research. Consequently, I had to make arbitrary decisions about which morphemes my subjects as a group were likely to know and use. These decisions set the rules for totaling the number of morphemes and computing the mean. Appendix C1 lists many of the decisions that were made, with some comments on the thinking behind them.

The length of individual utterances ranged from 1 to 14.

Noun Phrase Index

One could measure all aspects of grammatical development which are reflected in the gradual increase in utterance length. In this study I have attempted only a partial description, by means of four indices. One index measures the development of the noun phrase; two deal with verb usage; one gives the proportion of total utterances which contain both a subject and a verb.

The noun phrase was selected for measurement because it is a clear example of structural development taking place at the ages being studied, and because data is available on which to base a scale. The sequence of development of the noun phrase is described by R. Brown & Bellugi (1964, pp. 145-151) and is discussed in slightly different terms in McNeill (forthcoming). In the general discussion of developmental scales above I have reviewed briefly the stages which Brown & Bellugi found, and the way in which I assigned numbers to these stages to give a weighted index. Included in the index are additional points for each plural or possessive inflection. Thus the index measures the development of both syntax and morphology.

Following are examples of noun phrases for each score from 1 through 6. Symbols used are N (noun), M (any modifier), A (article), $M_{\bar{A}}$ (M-non-A, or any modifier other than an article), pl. (plural inflection s or es) and poss. (possessive inflection 's).

Score of 1
N: doggie
N + N: candy cane

Score of 2
M + N: my Mommy, some lollipop, a funny
N + pl.: cars

Score of 3
$A + M_{\bar{A}} + N$: a good idea, da other one, a dis Daddy
M + N + pl.: my lips, two mines, dose cars
N + poss. + N: Andy's pocket, lady's toy

Score of 4
$M_{\bar{A}} + M_{\bar{A}} + N$: his other ribbon, some more red
$A + M_{\bar{A}}$ + N + pl.: da big ones
M + N + poss. + N: my Mommy's house

Score of 5
$M_{\bar{A}} + M_{\bar{A}}$ + N + pl.: little tiny pieces
$A + M_{\bar{A}} + M_{\bar{A}} + N$: a little tiny crack
N + poss. + N + pl.: baby's balls

Score of 6
$A + M_{\bar{A}} + M_{\bar{A}} + M_{\bar{A}} + N$: an-other big old bug

As I pointed out in the earlier discussion, the scale is based on the criterion of complexity with one exception. Solely on grounds of sequence of emergence, $M_{\bar{A}} + M_{\bar{A}} + N$ is valued more highly than $A + M_{\bar{A}} + N$ by being given one additional point.

Details of the rules for using this index are given in Appendix C2. The child's final score was the total of his noun phrase points divided by the number of phrases. There was only one instance of a 6-point noun phrase score, and all scores of 5 and 6 occurred in the posttests.

Verb Complexity Index

A measure of verb complexity was important in this research because verb forms are a particularly complicated part of English grammar. Virtually all studies of deviations from conventional usage (e.g., Fries, 1940; Loban, 1963) have reported a concentration of problems in the use of verbs.

I was personally impressed with the prevalence of these problems when I visited the day-care center for older children to which my subjects would soon graduate. I listened to the four- and five-year-olds and took down utterances such as the following:

> You break the window
> You too rough
> The TV off
> I make it for you
> Where's this goes?
> My Mommy help me
> You gonna wake me up
> That's a flag. It move.

Some of these utterances contain actual errors at the morphological level of linguistic structure, such as a failure to observe the rules of subject-predicate agreement in the third person singular. My Mommy help me can be considered such an error. But of probably greater significance is the failure to encode a particular meaning in the most unique way by taking advantage of the rich possibilities afforded at the syntactic level by English verb auxiliaries.

Twaddell (1963) describes the formal system of verb constructions. There are four elements: past (*ed* etc.), current relevance (*have* + participle), limited duration (*be* + *ing*) and passive (*be* + participle). "Grammatically, these four modifications are potentially co-occurrent in all sixteen possible combinations" (Twadell, 1963, p. 2). In addition, pairs of modal auxiliaries (*could have*) provide for conditionality and sequence of tenses. The weakness of *My Mommy help me* as a communication lies in the use of a straight, unmodified lexical verb instead of one of this rich and complicated set of alternative possibilities. The selection of any one of these alternatives conveys more information just because the selection of one eliminates all the others.

The idea of measuring verb complexity is not new, but it has been used infrequently. Thirty years ago, Smith found that "In the case of verbs, the proportion of conjugated verbs of all types, whether formed by the use of auxiliary verbs or by change in the verb ending, increased from 17.7 at two years to 47.4 at five years" (1935, p. 201). More recently, in a study of social class differences in the speech of adolescents, Bernstein (1962b) counted verbal stems containing more than three units exclusive of negation, and expressed the total as a proportion of the total number of finite verbs uttered.

The verb index used in the present research is a further development of Smith's and Bernstein's work. Instead of using a dichotomy between non-conjugated and conjugated verbs. or between complex and not-complex verb stems, I have assigned points to each verb, totaled the points for each subject, and computed the mean. In contrast to the noun phrase index where one pattern received a higher score because developmentally it appeared later, in the verb index only complexity is rated. The points assigned are simply the total number of elements or operations. The term "operation" refers here to the question transformation by which You do like becomes Do you like? This transformation earned an additional point.

Appendix C3 gives further details on the rules for utilizing the verb complexity index. Following are examples of categories and assigned scores which show the range of responses. Symbols used are V (verb), preV (preverb), prP (present participle), pP (past participle), Aux (auxiliary) and ? (question transformation).

Score of 1	Unmarked V: I go, You put Irregular past or pP: He fell, it gone
Score of 2	prP alone: He going out Third person singular, present: She cooks supper Regular past: I dropped it; I dood again Aux + unmarked V: I'll make, I'm make, She's climb preV + V: He wanna sit; I hafta get something
Score of 3	Aux + prP: I'm getting dat Aux + preV + V: Mommy's gonna go bye-bye Aux + V + ?: May I have a lollipop?
Score of 4	Aux + preV + V + V as an objective predicate: I'm gonna let him knock this whole thing down

Scores of 4 were rare.

Copula Index

In their analysis of the gradual differentiation of the noun phrase and its integration into a larger structure, R. Brown & Bellugi (1964) comment on the development of Dat my cup into a predicate nominative sentence through the insertion of the verb form is. This development is measured in the copula index. Use of the verb to be as an auxiliary (I'm going) is measured in the verb index and is therefore ignored here.

Development of the use of the copula is of interest because it is such a definitive developmental phenomenon, and also because the subjects came from a general background in which omission of the copula has been previously observed. In his study of the speech of elementary school children in Oakland, California, Loban found that "For Negro subjects whose parents have migrated from the rural South, using the verb to be as it is employed in standard English proved to be twelve times as troublesome as for the Caucasian or Negro subjects whose parents were from the urban California background" (1963, p. 52). Bailey (1964) reports that absence of the copula, particularly with the predicate adjective (You weak, man) is a feature of Negro English in New York City and suggests that, historically, there may be a connection with Creole. Because my subjects were Negro children, it was of added interest to find out to what extent either expanding or modeling might increase the use of the copula beyond what would otherwise be expected.

The copula index can be defined as the ratio of the number of instances of copula presence to the number of situations in which it was clearly required. So if a child used the copula ten times out of twenty possibilities, his score would be .50. Counting the copulas present is easy; counting the situations where it is not present but is required is more difficult. In the rules (Appendix C2) for computing the noun phrase I mentioned that demonstrative plus noun, as in Dis one, was not counted as a noun phrase because it was ambiguous. It was not counted in the copula index for the same reason. The following are examples of constructions which were considered to have a copula missing: Dat my car, Dat one dere, Dis mine.

The percentage of copulas present to copulas required ranged from .04 (Derwin [M_3] pretest) to .94 (Tina [C_2] pretest).

Sentence Type Index

This index was established as an afterthought. In analysing the data for Deedee [E_3], I noted that from pretest to posttest her verb complexity index went from 1.28 to 1.25, while her mean length of utterance went from 2.29 to 2.96. At first glance it seemed surprising that there had not been greater development in the verb. Then I realized where the development was taking place. During this same period, the number of her verbs appearing with subjects jumped nearly eight times while the number of intelligible utterances only doubled. This brought to my attention what should have been obvious: development from no verb to verb precedes the development of more complicated verb forms. It seemed important to measure this aspect of grammatical development.

The sentence type index indicates the proportion of total intelligible utterances which have both a subject and a verb of any kind. The number of verbs in the verb index, the number of verbs excluded because of negation, and the number of copulas appearing with subjects were summed, then divided by the number of intelligible utterances.

The percentages ranged from .10 (Deedee [E_3] pretest) to .88 (George [C_4] midtest).

Statistical Analysis

In experimental design this research constituted a 3×2 randomized blocks factorial experiment with two replications per cell (Edwards, 1960). The first (I) factor, treatment, had three levels: expansion, modeling and control; the second (J) factor, tutor, had two levels: A and B. The blocks were the matched trios, with two blocks assigned to each tutor. While trio members were randomly assigned to treatments, trios were assigned to tutors on the basis of scheduling convenience and of child-tutor attachments that had been formed during the orientation period. This assignment of trios to tutors became important in the choice of error terms for the analysis of variance, and in the interpretation of results. To test the two hypotheses, an analysis of variance of the posttest scores was computed, with the pretest scores as the control variable. Covariance control was used to reduce the experimental error beyond the reduction accomplished by the formation of matched trios.

The organismic factors used for matching the trios were related to the variable used as the control, but were not identical to it. In brief review, the sequence of procedures was the following: orientation period, formation of trios, pretest, and the beginning of treatment. The trios were formed on the basis of the children's chronological age and of my impression of their talkativeness and level of language development. The covariance control for each child's posttest score on each of the six measures of language development was the child's pretest score on the same measure. It was therefore a better estimate of the child's initial status as to that one aspect of grammatical development.

The use of pretest scores for the control variable may not be as common as the use of a different measure, e.g., an intelligence quotient. But since the increase in precision depends on the degree of correlation between the control and the criterion variables, such use of pretest scores has been recommended (Lindquist, 1940).

The analysis of variance and covariance was done by computer with the ANOVA program (Cooley & Lohnes, 1962). In addition, a CORREL program (Cooley & Lohnes, 1962) was used to obtain means, standard deviations and intercorrelations of all 17 pretest, midtest and posttest scores. The CORREL analysis plus various formal and informal nonparametric techniques gave deeper insight into the data and contributed to the interpretation of results. While only pretest and posttest scores were used in the analysis of variance, the midtest scores were included in these supplementary analyses.[9]

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[9] I am grateful to Dr. Kenneth Jones of Harvard University for help in planning and executing the statistical analysis.

Chapter 3. Results

During the discussion of measurement procedures I suggested that the test of hypotheses in this research rested on the extent to which the measures of language development could separate the "figure" of developmental change from the "ground" of all other influences on a child's speech. Before examining the results of the analysis of variance, we should see to what extent this separation was achieved. In this chapter, the name of the dependent variable will be abbreviated: ImT (sentence imitation test), MLU (mean length of utterance), NPI (noun phrase index), VI (verb index), CI (copula index), and StI (sentence-type index).

Evaluation of Measures of Language Development

In evaluating the measures of language development I assume (1) that a developmental characteristic must either stay at the same level or increase; (2) that a valid measure of a developmental characteristic will yield scores conforming to that pattern to the extent that it taps the hidden current of developmental change; and (3) that fluctuation in the scores indicates, conversely, the presence of more superficial influences which decrease the validity of the measure. We can not assume that the perceived gain is the true gain, but we can assume that it is closer to a true picture of growth than fluctuating scores can be.

Table 3 gives means, standard deviations and correlation coefficients for pretest, midtest and posttest scores on the six measures for all 12 subjects combined. (Raw scores are given in Appendix D.) Three summary statements can be made.

(1) On all six measures, the means increase from pretest to posttest. Of the five midtest scores, the means for all but VI fall between the respective pretest and posttest means. A one-tailed t test was used to evaluate the significance of these correlated means, since only one direction of difference was of interest. Though none of the gains from pretest to posttest are statistically significant at the .05 level, the trend is clear and consistent.

(2) On all the measures, the standard deviations decreased from pretest to posttest. The standard deviation of the midtest scores occupy an intermediate position on two out of five measures. A two-tailed t test for correlated variances was applied. For one measure, MLU, the decrease in dispersion of the scores from pretest to posttest is significant at the .05 level. This decrease is unrelated to the question of validity and will be discussed in the interpretation of results.

(3) Correlations are highest for the pretest-midtest scores, lowest for the pretest-posttest scores. The latter can be explained by the doubled time interval. 10 of the 16 correlations are significant at the .05 level or less on a two-tailed test. At the two extremes, correlations for MLU are consistently significant, while correlations for VI remain non-significant.

Table 3

Means, Standard Deviations, and Correlation Coefficients of Six Language Measures

	Means[a]			Standard Deviations[b]			Correlation Coefficients[c]		
	Pre-test	Mid-test	Post-test	Pre-test	Mid-test	Post-test	Posttest-Midtest	Midtest-posttest	Pretest-posttest
Sentence imitation test	3.63		4.11	0.59		0.40			0.66*
Mean length of utterance	3.30	3.52	3.59	0.78	0.79	0.54*	0.89**	0.91**	0.84**
Noun phrase index	1.83	1.87	1.98	0.19	0.23	0.16	0.80**	0.52	0.27
Verb complexity index	1.48	1.46	1.53	0.19	0.20	0.14	0.48	0.57	0.17
Copula index	0.53	0.56	0.65	0.27	0.20	0.19	0.74**	0.68*	0.70*
Sentence-type index	0.41	0.48	0.49	0.17	0.15	0.11	0.71**	0.80**	0.57

[a] None of the increases from pretest to posttest are significant at the .05 level on a one-tailed test.

[b] Decrease from pretest to posttest significant on a two-tailed test is indicated by * ($p < .05$).

[c] Correlation coefficients significant on a two-tailed test are indicated by * ($p < .05$) or ** ($p < .01$).

On four of the six measures the pretest-posttest correlations are more than or very close to .60. At such a level, according to Feldt (1958), convariance produces greater precision than the factorial approach or analysis of variance of difference scores.

We can also view the gain in scores from another perspective. Instead of looking at the means for the 12 subjects, we can consider the change in score for each subject separately. Instead of testing the significance of the amount of mean gain, we can count the number of subjects who showed an increase, and determine the probability of obtaining that many or more changes in one direction by chance alone. Table 4 presents this analysis.

In Table 4 rules for the Sign Test for correlated samples (Siegel, 1956) were followed, and the sample size was reduced in cases of zero difference, even though only a drop in score would be inconsistent with the assumptions of how developmental measures should function. In summary, the probability of this proportion of subjects showing growth if non-developmental factors were being measured is <.05 for four measures, <.10 for one measure, and not different from chance for the remaining measure, VI.

These results give some encouragement that it is possible to measure the language development of very young children. True, only some of the results are statistically significant. Yet consistency across the several dependent variables strengthens the conclusion that the increased means and the high correlations are non-random phenomena. The use of multiple dependent variables, the measurement

Table 4

Sign Test of Direction of Change in Individual Scores

on Six Language Measures

(N = 12 unless otherwise noted.)

Test	Pretest <midtest	Midtest <posttest	Pretest <Posttest
Sentence Imitation Test			10 (p. .019)
Mean length of utterance	8	9	10 (p. .019)
Noun-phrase index	8	9	10 (p. .019)
Verb complexity index	7	9	7 (p. .387)
Copula index	9	9	9 (p. .073)
Sentence-type index	8[a]	7	9[a] (p. .033)

[a] N = 11 because of one zero difference.

of these variables at three points in time rather than the more usual two, and the use of several techniques of statistical analysis can thus compensate in part for the increased chance of a Type II error with so small a sample.

Not all of the dependent variables look equally promising. The results for ImT, the one test, are encouraging. (For this one measure, complete protocols are given in Appendix E.) It is not possible to say which of the six measures of spontaneous speech is the most valid, but MLU seems to be at least as good as any of the others. This is fortunate, in view of its widespread use. But until simpler rules can be devised for computing MLU, comparison of the results obtained by different investigators is probably unwise.

It does seem certain that of these six measures VI is the least valid. Only on this measure do both means and standard deviations fluctuate. It is also the only measure for which none of the three correlation coefficients reaches statistical significance. I was disappointed in this result, and cannot adequately explain it. Maybe the seeming lack of validity is related to the criteria (complexity rather than sequence of emergence) used in establishing the developmental scale on which the index is based. Maybe the true picture of development is somehow different for verbs. I mentioned above that Deedee's(E_3) progress in verb usage was more from absence to presence than from less to more complex. Another indication of oddness is that scores for all four control group children dropped on VI from pretest to posttest (see Appendix D4). Had this result been obtained on MLU, I would have suggested that the control group children felt less at ease with us than did the children in the expansion and modeling groups, whom we saw every day. But situational influences on verb complexity are harder to explain. I can only raise these questions in the hope that they can be answered in future studies.

The final question about the developmental measures is how much they correlate with each other. A high correlation between two measures does not necessarily mean they are measuring the same phenomenon. Growth of two different aspects of grammatical development could proceed simultaneously yet independently. But a low correlation would signify relative independence.

If we consider the pretest, midtest and posttest scores as three sets of scores, there are two correlations between ImT and another measure, and three correlations between any other pair of measures, e.g. MLU and NPI. Table 5 gives the correlations for which $p <.05$ on a two-tailed test. Lines have been substituted for non-significant correlations in order to differentiate among pretest-midtest correlations (top line), midtest-posttest correlations (middle line) and pretest-posttest correlations (bottom line).

10 of the 40 correlations are statistically significant. The only measure of spontaneous speech which correlates with ImT is NPI. I can propose no explanation of this finding. The frequent correlations among MLU, NPI and StI probably reflect an underlying dimension of increased length. VI and CI are more independent, with VI again in the extreme position. If VI had a good record as a valid developmental measure, such independence would be an asset to a battery of tests and indices. But because there are other symptoms of difficulty with this

Table 5

Correlations among Measures of Language Development

	Imitation test	Mean length of utterance	Noun phrase index	Verb index	Copula index	Sentence-type index
Imitation test	1.00	— —	.60 .60	— —	— —	— —
Mean length of utterance		1.00	— .68 .81	— — —	— — —	.86 .92 .91
Noun phrase index			1.00	— — —	— .60 —	— — .78
Verb index				1.00	.78 — —	— — —
Copula index					1.00	— — —
Sentence-type index						1.00

index, its independence here only increases the suspicion about what is being measured.

Test of Hypotheses

In the above discussion, treatment groups were ignored. Now they become the focus of investigation. We want to know to what extent the treatments made a differential contribution to the general trend of increased means.

The experimental design, as originally planned, called for a two-way analysis of variance, treatment (I) x tutor (J). Because of the method of assigning trios to tutors, it seemed possible that the J effect was both a tutor effect and an initial language level effect; it seemed possible, that is, that tutor A had the oldest and most advanced trio (T_1) and the youngest and brightest trio (T_4), while tutor B had the two trios (T_2 and T_3) who were intermediate in age and neither as advanced as T_1 nor as bright as T_4. Initial language level can be defined operationally as the sum of a child's ranks on the pretest scores. Table 6 lists the subjects in order from most advanced to least advanced, and simultaneously separates them according to tutor assignment. The first column to the right of the names gives the sum of the pretest ranks. These can range from a high of 6 to a low of 72. (The last column of Table 6 will be discussed later.) We see that with the exception of Tina (C_2), the division of subjects between tutors does indeed correspond to a division between more and less advanced in initial language level.

This correspondence has two implications for the analysis of

Table 6

Subjects: Tutor Assignment, Pretest Ranks and Gain Score Ranks

Subject		Sum of pretest ranks	Sum of gain score ranks
Tutor A	Tutor B		
George (C_4)		16.5	51.0
	Tina (C_2)	17.5	65.5
Karen (M_1)		18.0	52.0
Donessa (E_1)		32.0	50.0
Lisa (M_4)		39.0	35.5
Angie (C_1)		39.0	31.0
Nancy (E_4)		40.0	43.5
	Yvonne (C_3)	42.5	36.5
	Ronnie (E_2)	53.0	24.0
	Pamela (M_2)	53.0	19.5
	Derwin (M_3)	58.0	23.5
	Deedee (E_3)	59.5	36.0

variance. First, tutor effect and initial language level effect are confounded. I will return to this point in the discussion of results. Second, Tina (C_2) is misplaced. Because she was less talkative than the other children, I underestimated her initial language level. She should have been in trio_1, and Angie (C_1), who is the same age (see Table 1, p. 31), should have been in trio_2. Since by random assignment both children went into the control group where tutor assignment has no meaning, this misplacement had no effect until time for the statistical analysis. Here it is important that the children in the two treatment groups be compared with children as close as possible in age and initial language level. With only two subjects per cell, a mismatched child can distort the means and give uninterpretable results. Fortunately, the misplacement can be corrected by exchanging the scores of Tina (C_2) and Angie (C_1). This exchange was made in all the analyses, parametric and nonparametric alike.

Table 7 gives the analysis of variance. The error term for both main effects and for interaction is the within mean square. For significance at the .05 level, $F_{2,5} = 5.79$. Three findings should be noted.

(1) There is a significant treatment effect on ImT. The F ratio is 5.19, just under the 5.79 required. But if the sums of squares are pooled, as they can be when there is no interaction, the F ratio becomes 6.09. Table 8 on the following page shows that modeling and control are significantly better than expansion.

(2) There is a significant tutor-initial language level

Table 7

Analysis of Variance of Measures of Language Development

(I effect: treatment; J effect: tutor and/or initial language level)

Source	NDF	SS	Mean Square	F ratio	P
		A. Sentence Imitation Test			
I EFFECT	2	0.5734	0.2867	5.19	.05<p<.10
J EFFECT	1	0.0125	0.0125	<1.00	
I × J	2	0.0537	0.0268	<1.00	
WITHIN	5	0.2759	0.0552		
TOTAL	10	0.9155			
		B. Mean Length of Utterance			
I EFFECT	2	0.3778	0.1889	2.76	N.S.
J EFFECT	1	0.4466	0.4466	6.52	p<.05
I × J	2	0.1107	0.0554	<1.00	
WITHIN	5	0.3423	0.0685		
TOTAL	10	1.2774			
		C. Noun Phrase Index			
I EFFECT	2	0.0365	0.0183	<1.00	
J EFFECT	1	0.0338	0.0338	<1.00	
I × J	2	0.0388	0.0194	<1.00	
WITHIN	5	0.1598	0.0320		
TOTAL	10	0.2690			

Table 7--Continued

Source	NDF	SS	Mean Square	F ratio	P
D. Verb Complexity Index					
I EFFECT	2	0.0158	0.0079	<1.00	
J EFFECT	1	0.0071	0.0071	<1.00	
I × J	2	0.0716	0.0358	1.79	N.S.
WITHIN	5	0.0999	0.0200		
TOTAL	10	0.1945			
E. Copula Index					
I EFFECT	2	0.0367	0.0183	1.59	N.S.
J EFFECT	1	0.0158	0.0158	1.37	N.S.
I × J	2	0.0782	0.0391	3.40	N.S.
WITHIN	5	0.0577	0.0115		
TOTAL	10	0.1884			
F. Sentence-type Index					
I EFFECT	2	0.0010	0.0005	<1.00	
J EFFECT	1	0.0117	0.0117	1.35	N.S.
I × J	2	0.0368	0.0184	2.16	N.S.
WITHIN	5	0.0424	0.0085		
TOTAL	10	0.0918			

effect on MLU. Table 8 shows that B level is better than A level.

(3) There is no evidence of interaction.

Table 8

Adjusted Means for I and J Effects

	I Effects			J Effects	
	E	M	C	A	B
ImT	3.78	4.29	4.26*	4.06	4.17
MLU	3.74	3.79	3.26	3.28	3.91*
NPI	2.00	2.04	1.91	1.88	2.08
VI	1.57	1.60	1.41	1.55	1.50
CI	0.57	0.70	0.67	0.60	0.69
StI	0.48	0.50	0.49	0.45	0.54

*Significant at .05 level

Obtaining two F ratios out of 18 significant at the .05 level is almost a chance event. It is important, therefore, to find out whether these findings represent a trend of which only two instances reach the .05 level. Looking again at Tables 7 and 8, we see that on all six measures, the modeling group is best, and on every measure except (the least valid) VI, B level did better than A level. We can conclude that these two trends do exist.

In all the above analyses the six dependent variables are considered separately. It is possible to compare the over-all growth of children in the three groups if we define growth operationally as the sum of the child's gain score ranks. Gain scores can be computed from the raw scores in Appendix D. The sum of the gain score ranks is given in the last column of Table 6, p. 79. Because these are ranks, the smallest number represents the greatest gain. As in the preceding column of the same table, the numbers can range from 6 to 72. The means for the six cells are as follows:

	A	B
E	47.25	30.00
M	43.74	21.50
C	58.25	33.75

In summary, all three B-level groups gained more than any of the A-level groups; and within the levels the relative position of the three groups is the same - modeling best, then expansion, and last control.

To see if this relative position of the groups is significant, Friedman's non-parametric analysis of variance by ranks (Siegel, 1956) can be used. Placing the summed gain score ranks given in Table 6 into columns according to treatment group, and into rows according to trio, we obtain the results given in Table 9. $\chi_r^2 = 6.5$. With 2 df, the exact probability is .042. Because each child is ranked according to the sum of ranks on six somewhat correlated measures, this probability is probably inflated. It would be more conservative to conclude that the modeling group gained most and the control group gained least, but at a significance level which is hard to estimate because of the kind of scores.

One findings remains to be discussed--the general decrease in standard deviations from pretest to posttest. Such a decrease cannot be dismissed as a common developmental phenomenon. In Templin's (1957) study, for example, the standard deviations show considerable fluctuation over time. The most obvious explanation for a decrease in the dispersion of scores is that children who were initially low gained more than children who were initially high. This hypothesis can be

Table 9

Analysis of Variance of Gain-score Ranks

(Summed ranks for each child are given in parentheses, followed by the rank of that sum within the trio.)

Group	Treatment		
	E	M	C
Trio$_1$	(50.0) 1	(52.0) 2	(65.5) 3
Trio$_4$	(43.5) 2	(35.5) 1	(51.0) 3
Trio$_2$	(24.0) 2	(19.5) 1	(31.0) 3
Trio$_3$	(36.0) 2	(23.5) 1	(36.5) 3
Sum of ranks	7	5	12

tested by a comparison of the last two columns of Table 6, to which separate reference has already been made. The Pearson product-moment correlation between the sum of the pretest ranks and the sum of the gain score ranks is -.86 ($p < .005$). Initial language level and amount of growth in language development are thus inversely related: the lower the starting point, the higher the gain, and vice versa.

Table 6 also shows that within levels A and B, whether considered as tutor or initial language level, the children who were randomly assigned to the control group happened to be at, or very near, the most capable end of the range. This chance event may afford a partial explanation of why the control group children did not show as much growth as the children in the two treatment groups. The superiority of the modeling treatment, however, which appears both in the parametric analysis of variance and the non-parametric analysis of variance by ranks, cannot be explained so easily. The expansion children were, on the average, at least as low as the modeling children (level B), or even lower (level A). Given the over-all high correlation between low initial status and high gain, one would expect the expansion group to gain the most. The fact that the modeling children gained the most lends additional support to the conclusion that modeling was the more effective treatment.

Chapter 4. Summary and Discussion

On the basis of the results, neither of the hypotheses is confirmed:

(1) The first hypothesis stated that "children whose language is expanded or who merely hear more language spoken will show greater language growth than do children who receive neither treatment." The status of this hypothesis is unclear. On the parametric analysis of variance there was no evidence of superiority of modeling and expansion groups over the control group. On the non-parametric analysis of gain scores there was such evidence, but this may be partially explained by the chance assignment of the initially most capable children to the control group.

(2) The second hypothesis stated that "of the two treatments expanding will be the more effective." This hypothesis is rejected. There is no evidence that expansions, as provided in this research, aid the acquisition of grammar. All indications, without exception, suggest that modeling is the more effective treatment.

The results, tentative as they must be because of the small sample, have implications for theories of the child's acquisition of grammar and for practices of compensatory education. But first we should explore the meaning of the highly significant negative correlation between initial language level and amount of growth in language development. Five explanations might be offered.

(1) Perhaps tutor A, who had the most able children, was not as effective as tutor B. As previously acknowledged, tutor effect and initial language level effect became confounded and cannot be separated statistically. Nevertheless, I believe that tutor effect is actually unimportant for two reasons. First, the greater gain of the B-level children is true even for the control groups where tutor effect has no meaning. Second, I find no evidence in the tutor's behavior of differential effectiveness. Tutor A is from Australia with training in the care and education of young children. She is crisp in her movements and beautifully precise in her speech. She has some British words in her vocabulary (e.g., tread for step, and braces for suspenders), and a British-type Australian accent which was judged non-interfering by a linguist consultant.[10] Tutor B is from New York City, with experience as a counselor in a resident school for severely emotionally disturbed children. She is more relaxed in her movements and posture, and less precise in her speech. On a qualitative evaluation of the tutors' speech, the advantage would be with tutor A. A quantitative comparison of the amount of language provided by the two tutors also fails to substantiate a claim of tutor effect. On the treatment tapes, the average number of sentential

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[10] See footnote 8, p. 46.

adult utterances spoken per eight minutes and the range (given in parentheses) are as follows:

	Tutor A	Tutor B
E	88 (55-104)	78 (46-110)
M	68 (43- 94)	78 (45-101)

(2) A ceiling effect in the measures might have prevented the more able children from demonstrating the growth which had actually taken place. This is possible for ImT, which did have a ceiling of 5.0 morphemes per sentence. But even here George (C_4) was tied for the second highest pretest score (4.07) and showed the third highest gain score (.72). A ceiling effect in the measures of spontaneous speech seems unlikely for any of the children except George. And his scores, especially on MLU, NPI and StI, indicate how much growth is possible for a child still less than three years old.

(3) A statistical explanation of regression toward the mean might be given. Such an explanation would fit a simple redistribution of scores; it cannot account for increased means, and generally high pretest-posttest correlations. As Lord (1958) points out, if higher initial scores result in less gain when errors of measurement have been minimized, the explanation must be sought in real life and not in statistical theory.

(4) Children who started out at the lowest level might have undergone a spontaneous spurt of growth that happened to coincide in time with this study. This is the phenomenon of the

"late bloomer." Maybe Pamela (M_2) and Derwin (M_3) were entering a period of rapid language growth at the time of the pretest. If random assignment happened to place them in the same treatment group, their spontaneous growth would then be attributed improperly to that treatment. With such a small sample the possibility of such an event cannot be completely rejected by internal evidence alone. But I know of no evidence from other research to support the assertion that children who are behind in language development just naturally catch up. (5) The treatments may have made a greater contribution to the B-level children. The fact that the A-level children were already more advanced may indicate the prior presence of a level of exposure to language in their non-treatment environment, beyond which the stimulation added in this research made no difference. Similarly, the gain of the B-level children may be an indication of a gap between the actuality of their low initial status and the potentiality provided by organic factors. This gap, presumably caused by verbal deprivation, may have been narrowed by the treatments. In selecting the twelve subjects, I assumed that any child who spends 8-10 hours per day in the conditions of this day-care center is by definition verbally deprived. I did not investigate the homes at all. It is possible that the A-level children receive adequate language exposure at home, even if their home life does constitute only a small part of their waking hours. The gain of the B-level children, presumably due at least in part to the additional 30-40 minutes per day of intensive language stimulation, suggests that the duration of exposure need not be long.

Probably the full explanation is some combination of (2), (4) and (5). While a ceiling effect and spontaneous growth may have contributed to the gain of the B-level children, the contribution of the modeling treatment to the remarkable growth of Pamela (M_2) and Derwin (M_3) cannot be discounted.

Because there is no evidence that expansions help, the theory supporting the second hypothesis is called into question. Alternative hypotheses have to take into account the surprising finding that expansions did not help as much as increased exposure alone. Even if the contingent nature of their relation to the child's speech did not convey more information to the child about the ways of encoding experience in his language community, it is not obvious why expansions should convey less. The only explanation I can offer is that as the concentration of expansions goes up--in this case far above that naturally occurring in parent-child conversation--the richness of the verbal stimulation goes down. Expansions are by definition contingent on the child's speech in content as well as in timing. To the extent that they are pure expansions, just filling in the child's telegraphic utterance to make a complete sentence, they will have less variety of vocabulary and grammatical patterns than the adult's non-expanding speech normally contains. The suggestion that the richness-impoverishment dimension may be critical thus gains some support.

Ideally, this study should be replicated with a much larger sample representing many more levels of initial language level, particularly those below language level B. The two requirements of size and representativeness are intimately related. A large sample would enable the researcher to plan a randomized blocks factorial experiment with no pretest. Eliminating pretests would make it possible to use children who were initially less mature linguistically than the subjects in this study.

Whether such a study would be feasible depends on at least two factors. One is the availability of more tests of grammatical development which would relieve the researcher of the necessity of taping, transcribing and coding hours of samples of spontaneous speech. Second is the use of mothers rather than tutors to administer the treatments. Irwin (1960) successfully induced mothers to read to their children. I made no attempt to use mothers, because I did not know if they could be taught to expand, and because I was concerned about equating the time of the two treatments. In view of the results of this small-sample study, these disadvantages assume less importance than the potential advantages of working with a larger sample of children over a longer period of time without prohibitive expense.

In the literature on how to help culturally deprived children overcome retarded language development, both increased verbal stimulation and increased "corrective feedback" are recommended. The results of this study support the recommendation that increased and enriched verbal stimulation is helpful for children who truly are deprived; the results do not support the recommendation that corrective feedback, even in the naturally occurring form of expansions, should be deliberately emphasized. The results, tentative as they are, suggest that the characteristic of richness is more important than the characteristic of contingency. It should be noted that reading to the child was the way in which Irwin (1960) successfully increased the verbal stimulation of his subjects, and it was also a beloved part of the modeling treatment in this study.

Anyone considering the implications of this study for the education of young children should keep in mind two qualifications on its generality. First, as has already been noted, the increased exposure to language was provided in the context of child-adult conversation. While we have no way of determining how much the context of one-to-one conversation with a warm and attentive adult may have contributed to the effect, there is no reason to assume that increased exposure via TV, for example, would bring the same results.

Second, this study was confined to environmental assistance to the child's acquisition of grammar. While feedback, here provided in the form of expansions, did not aid the acquisition of grammar, it may be important in other aspects of language development such as the growth of meanings. The acquisition of grammar may be a unique part of the entire domain of the development of conceptual knowledge, with unique requirements for environmental assistance.

APPENDIXES

and

REFERENCES

Appendix A. Partial List of Childrens' Books Used

Of 70 books used during the research, the following 18 were the most successful. All except the two by Keats were obtained at a local library. Since the subjects were Negro children I wanted some books with Negro characters. Although the number of such books is increasing, the proportion is still so low that the library patron is not apt to find any on the library shelves. Both books by Keats are about a delightful little Negro boy and met all criteria for this research. They were therefore purchased and made available to the children throughout the period of the study.

Birnbaum, A. Green Eyes. New York: Capitol, 1953.

Buckley, Helen E. Grandfather and I. New York: Lothrop, Lee & Shepard, 1959.

Buckley, Helen E. Grandmother and I. New York: Lothrop, Lee & Shepard, 1961.

Buckley, Helen E. Josie and the Snow. New York: Lothrop, Lee & Shepard, 1964.

Carroll, Ruth. Where's the Bunny? New York: Columbia University Press, 1950.

Carroll, Ruth. Where's the Kitty? New York: Henry Z. Walck, 1962.

Gipson, Morrell. Hello Peter. Garden City, N.Y.: Doubleday, 1948.

Green, Mary McBurney. Is it Hard? Is it Easy? New York: William R. Scott, 1948.

Hogan, Inez. Upside Down Book. New York: E. P. Dutton, 1955.

Hurd, Clement. Run, Run, Run. New York: Harper, 1951.

Keats, Ezra Jack. The Snowy Day. New York: Viking, 1962.

Keats, Ezra Jack. Whistle for Willie. New York: Viking, 1964.

Kessler, Ethel & Kessler, Leonard. Kim and Me. Garden City, N.Y.: Doubleday, 1960.

Krasilovsky, Phyllis. The Very Little Boy. Garden City, N.Y.: Doubleday, 1962.

Lenski, Lois. The Little Auto. New York: Oxford University Press, 1934.

Lenski, Lois. Big Little Davy. New York: Henry Z. Walck, 1956.

Tooze, Ruth, Monkey See, Monkey Do. New York: Grosset & Dunlap, 1949.

Woodcock, Louise. The Smart Little Boy and His Smart Little Kitty. New York: William R. Scott, 1947.

Appendix B. Excerpts from Transcriptions of Treatment Sessions

1. Expansion

The following is an excerpt from one expansion session with Ronnie (E_2) and tutor B. The child's speech is on the left and the adult's speech on the right. Sentences in the middle describe the non-verbal context. A line (______) stands for an unintelligible sound. The adult's utterances have been coded as follows:

E - an expansion
EP - an expansion with a pronoun reversal
(this-that, my-your, etc.)
M - a match
MP - a match with a pronoun reversal

	Ronnie is building with blocks. He has just made block steps.	
		Oh, they're very high.
Very high		
	E	They're very high. What a climb!
A tree I taking down trees Up here's a Mother		
	M	Here's a Mother. Where's Mother going?
Up the stairs Dis side		
	EP	On that side?
Oops! ___ ___ ___ ___ Like dis Oops!		
		What's that?
The Mother going up stair She too big		
	E	She's too big?
Can't fit her right here She sit down - look at dat		
		I see that.
She sitting down		
	E	She's sitting down?
He go in a water		
	E	And he's going in the water?
Yeah Eeeeee -		
		What did the Mother do?
Fall out		
	E	She fell out?
Yeah He's going Dis color		
	MP	That color? What about that color? No! On the paper with the crayon. Here's paper.

2. Modeling

The following is an excerpt from one modeling session with Pamela (M_5) and Tutor B. The format is the same as on the preceding page.

I read a book	
	What?
I read a book ____ Peter	
	Is that what you found? What's he doing?
Read a book like dis	
	He is! Do you think he knows how to read?
I sit on your lap	
	Oh!
C'mon, read dis	
	I'm going to. Let me finish putting this away. You know I like to - You're falling down!

The microphone is turned off while the story is read. When it is turned on again Pamela is still on the tutor's lap, now facing her and buttoning her sweater.

	OK, thank you.
I button dis one?	
	That's the last one. I'll be all buttoned up. Who taught you how to button buttons? Pamela, who taught you how to do that? That was the last one. No more.
Why?	
	I'm warm enough.
Dat's you watch	
	That's right. How does it sound?
______________ (too soft)	
	(laughing) The watch goes 'tick, tick.' What'd you - (interrupted)
Who broke the comb?	
	I told you who did. Who did that?
Donessa (another child)	
	No! I never said that. Who'd I say?
Who broke dis?	
	Mrs. Dyson! (herself) I'm a bad girl.
You a bad girl	
	Yeah.
Tell you Mother'n you	
	Oh, no, don't do that.

Appendix C. Rules for Measures of Language Development

1. Mean length of utterance

A. Nouns

1. Nouns were counted as 2 morphemes when it seemed likely that the separate elements were meaningful to the child. E.g.:

   candlestick
   cowboy
   pocketbook
   washcloth
   bathroom
   blackboard
   boyfriend
   bubblegum
   airplane
   sailboat
   haircut
   doughnut
   myself
   something
   nobody

   Other nouns were counted as only 1 morpheme. E.g.:

   telephone
   Christmas
   band-aid
   lollipop
   handkerchief
   kool-aid
   sandwich
   jack-o-lantern
   Humpty-Dumpty
   Santa Claus
   breakfast
   ABC

   This division roughly corresponds to the contrast which Berko (1958) found between compound nouns where the salient feature corresponds to one element and those where it does not. In her examples, you put fire in a *fireplace*, but you eat cake on a *birthday*.

2. All plural suffixes were counted separately, except in the few cases where no plural meaning seemed likely, as in *scissors* or *pants*.

B. Pronouns were counted as more than 1 morpheme if the constructive nature of the word was obvious. So *yours* was counted as 3 morphemes (you + r + s), but *his* was counted as 1.

C. Verbs

1. Contractions of auxiliary verbs and *not*, such as *don't* and *can't*, were counted as 1 morpheme, because there is evidence (R. Brown, unpublished memorandum) that developmentally they appear as a "chunk" before the appearance of the corresponding affirmative.

2. The specific contractions *it's*, *dat's* and *what's* (often pronounced *iss*, *das* and *whas*) were counted as 1 morpheme because of the appearance of such utterances as *Das ones go here* and *Whas is dis?*. All other contractions with auxiliaries were counted as 2 morphemes, e.g., *I'll* and *who's*.

3. Irregular pasts and past participles, such as *fell* and *gone*, were counted as 1 morpheme, because developmentally they appear as separate vocabulary items prior to the regular forms (Ervin, 1964, p. 179).

4. All regular verb endings (ed, s, ing and en) were counted separately.

5. A set of preverbs used with great frequency by children were each counted as 1 morpheme: wanna, lemme, hafta, gonna; also gimme.

D. Miscellaneous words

1. The following were counted as single morphemes:
    - almost
    - today
    - backward
    - tomorrow
    - yesterday
    - because
    - already (but not all ready)
    - around (but not a round circle)

2. Another, a frequent word, was counted as 2 morphemes, by analogy with no other and the other.

2. Noun phrase index

A. All negatively modified nouns were excluded from the count. Because of the form of negation often used by these subjects, as in I ain't got no car, the negative element not or no often replaced any modifiers. This meant that a child who used negation a great deal, as did Derwin [M$_3$], would be at a disadvantage in comparison with other children.

B. Noun phrases were not considered to extend across pauses. So in Das a -- three spoons, only three spoons was counted. This rule was instituted not only because pauses frequently made the structure ambiguous, but because R. Brown & Bellugi (1964) present a strong case for the psychological unity of the noun phrase as a sentence constituent.

C. N + N combinations (candy cane and telephone bell) were counted as single nouns on the noun phrase index, even though they were counted as separate morphemes in computing mean length. Such nominal compounds are very frequent in the protocols, and there is no evidence that they are constructed by the child. This rule solved the problem of what to do with ambiguous utterances like Making a picture stove and Das a tree bird. In both cases the noun phrase was considered to be A + N and scored as 2. The rule also made it impossible to give credit for what was probably an immature possessive construction with the possessive inflection still missing. But unless that inflection was present, the child's intention remained unclear (And Barbara new dress). In the interest of the arbitrary rules essential for fair testing of hypotheses, this limitation was accepted.

D. Immature forms such as a trees and a dis Daddy were counted the same as their more "correct" equivalents.

E. Because a count of 1 for an unmodified noun had the practical result of lowering the child's mean score, certain unmodified nouns were not counted if modification would be inappropriate.

1. Nouns in certain specific expressions of place and time were not counted: go to bed, go home, at work, at night.
2. Modification was considered optional with Mother and Daddy and with the names of colors. If any modification was present, as in the Daddy or the red, the phrase was scored. Such cases were frequent in our protocols because of frequent references to the set of rubber dolls and the crayons. But if no modification was present, the noun was ignored.

F. Possessive pronouns were counted only if the correct form was used. The intent here was not to penalize for incorrectness, but to give credit only where the structure was clear. So your shirt was scored as 2, but you shirt as only 1.

G. A was not counted as an article where it was obviously a reduction of another word. It was considered a reduction of of in Some a dis, and a reduction of it in Take a back.

H. Plural inflections were not counted separately on the few words which were counted as single morphemes, such as scissors or pants.

I. Words other than nouns which were used as nouns were counted only when they were modified. So a somes and two mines were each counted as 3 points.

J. Demonstrative + noun patterns (Dis way, Dat one), were counted only when they were part of a larger construction which made it possible to distinguish noun phrases (Dis piece it was?) from telegraphic versions of predicate nominative sentences with the copula omitted (Now, dat my money). The arbitrary separation of these two grammatical structures required a subset of arbitrary decisions.

3. Verb complexity index

A. A lexical verb was counted if it had a subject and was not negated.

1. Limiting this index to lexical verbs eliminated the copula, which is the focus of a special index.

2. Using only those verbs which have a subject eliminated all imperatives. Imperatives are very common in child speech, and their use is strongly determined by the situation. Since an imperative is an unmodified form, except in the negative, a child who uses many imperatives will have a more "diluted" verb complexity score for a reason which has nothing to do with grammatical development.

3. Eliminating negated verbs from the index meant that a child could not obtain a high score simply by frequent responses of *I don't know* or *I can't do it*.

B. Because pauses always contribute some ambiquity, a verb was counted only if it was on the same side of a pause as its subject. In *Mommy want me -- put dis on*, *want* received a score of 1; similarly *wanna*, in *Her wanna -- hold dis*.

C. The verb in each clause was counted separately. In *You saw we had turkey*, *saw* and *had* each received 1 point. In *Lookit I did*, only *did* was counted, since *look* had no subject. The structure of verbs in separate clauses was thus rated differently from the objective predicate structure as in *I make lollipop all gone*. Here *make . . . gone* was considered a single verb with a count of 2.

D. In the case of a compound predicate, both verbs were counted if they received the same score; if not, then only the verb closest to the subject was counted. In *Somebody jumps and bites*, each verb received 2 points. In *He's coming and get out*, only the first verb was counted, for a score of 3. This rule prevented any penalty for a correct use of ellipsis.

E. As on other measures, there was no penalty for errors. In fact, I took special pleasure in assigning scores to such forms as *I dood* (2), *It broked* (2) and *He's upped* (3), because these are so obviously creative constructions.

Appendix D. Scores on Measures of Language Development

1. Sentence Imitation Test

	Pretest	Posttest
E_1	4.14	4.07
E_4	3.93	3.64
E_2	3.29	3.86
E_3	3.79	3.93
M_1	4.43	4.86
M_4	3.79	4.29
M_2	3.50	4.21
M_3	2.36	3.57
C_1	2.86	3.93
C_4	4.07	4.79
C_2	4.07	4.21
C_3	3.29	4.00

2. Mean Length of Utterance

(N is given in parentheses following each mean.)

Subject	Pretest	Midtest	Posttest
E_1	3.55 (189)	3.44 (226)	3.57 (299)
E_4	2.98 (168)	3.25 (224)	3.51 (284)
E_2	3.21 (308)	3.53 (379)	3.72 (271)
E_3	2.29 (152)	2.60 (283)	2.96 (299)
M_1	3.56 (148)	3.72 (149)	3.59 (265)
M_4	3.70 (250)	3.41 (266)	3.86 (288)
M_2	2.39 (111)	3.33 (218)	3.44 (202)
M_3	2.66 (299)	3.19 (378)	3.33 (406)
C_1	3.46 (186)	3.23 (293)	3.75 (307)
C_4	5.20 (200)	5.85 (172)	5.08 (160)
C_2	3.79 (139)	3.61 (189)	3.18 (207)
C_3	2.81 (175)	3.09 (257)	3.15 (326)

3. Noun Phrase Index

(N is given in parentheses following each score.)

Subject	Pretest	Midtest	Posttest
E_1	1.89 (104)	2.03 (134)	2.06 (157)
E_4	1.68 (88)	1.58 (153)	1.83 (284)
E_2	1.69 (175)	1.80 (143)	1.94 (157)
E_3	1.70 (108)	1.64 (95)	1.88 (131)
M_1	2.15 (52)	2.20 (92)	2.17 (111)
M_4	1.98 (172)	1.92 (120)	2.05 (151)
M_2	1.62 (59)	1.87 (127)	2.23 (84)
M_3	1.76 (110)	1.48 (99)	1.84 (148)
C_1	1.69 (106)	1.79 (160)	2.01 (158)
C_4	2.19 (80)	2.23 (105)	2.12 (84)
C_2	1.93 (105)	2.01 (74)	1.68 (114)
C_3	1.73 (95)	1.84 (143)	1.97 (152)

4. Verb Complexity Index

(N is given in parentheses following each score.)

Subject	Pretest	Midtest	Posttest
E_1	1.33 (72)	1.53 (57)	1.55 (110)
E_4	1.64 (45)	1.92 (65)	1.78 (97)
E_2	1.33 (112)	1.34 (148)	1.52 (90)
E_3	1.28 (11)	1.11 (66)	1.25 (84)
M_1	1.41 (71)	1.46 (48)	1.58 (62)
M_4	1.27 (81)	1.28 (87)	1.62 (79)
M_2	1.38 (16)	1.44 (73)	1.52 (82)
M_3	1.36 (80)	1.56 (137)	1.44 (174)
C_1	1.68 (74)	1.38 (97)	1.51 (128)
C_4	1.77 (115)	1.52 (106)	1.31 (88)
C_2	1.71 (48)	1.58 (78)	1.59 (73)
C_3	1.65 (48)	1.38 (87)	1.64 (90)

5. Copula Index

(The N in parentheses following each percentage is the number of instances where a copula was required.)

Subject	Pretest	Midtest	Posttest
E_1	.52 (25)	.60 (15)	.50 (24)
E_4	.93 (15)	.69 (32)	.77 (30)
E_2	.24 (45)	.45 (40)	.59 (54)
E_3	.29 (14)	.31 (58)	.34 (58)
M_1	.75 (12)	.79 (19)	.77 (39)
M_4	.50 (20)	.52 (21)	.82 (50)
M_2	.67 (6)	.43 (21)	.75 (16)
M_3	.04 (48)	.14 (29)	.37 (38)
C_1	.55 (22)	.72 (39)	.82 (43)
C_4	.36 (28)	.64 (22)	.44 (16)
C_2	.94 (16)	.68 (25)	.71 (14)
C_3	.60 (25)	.75 (30)	.86 (35)

6. Sentence-type Index

(The N in parentheses following each percentage is the total number of utterances.)

Subject	Pretest	Midtest	Posttest
E_1	.49 (189)	.35 (226)	.46 (299)
E_4	.35 (168)	.44 (224)	.47 (284)
E_2	.41 (308)	.53 (379)	.48 (271)
E_3	.10 (152)	.29 (283)	.36 (299)
M_1	.59 (148)	.48 (149)	.41 (265)
M_4	.41 (250)	.41 (266)	.47 (288)
M_2	.18 (111)	.39 (218)	.50 (202)
M_3	.31 (299)	.51 (378)	.56 (406)
C_1	.49 (186)	.44 (293)	.59 (307)
C_4	.72 (200)	.88 (172)	.78 (160)
C_2	.45 (139)	.56 (189)	.45 (207)
C_3	.36 (175)	.44 (257)	.39 (326)

Appendix E. Protocols for Sentence Imitation Test

(The top version of the model sentence was given on the pretest and the bottom version on the posttest. Below each set of sentences are the respective scores)

1. Trio$_1$

	Model Sentence	Donessa (E_1)
1.	We're sitting down.	We're sitting down We're sitting down
2.	Mother dropped a spoon.	Mother dropped a spoon Mother dropped a spoon
3.	They won't play.	They won't play Dey won't play
4.	She can bring that apple.	She could bring dat apple She could bring dat apple
5.	It wasn't raining.	It ___ was no raining It wasn't raining
6.	He wants to jump.	He wants to jump She wants a jump
7.	This train goes fast.	Da train go fast Dis train go fast
8.	They don't have to run.	Dey have to run I have to run
9.	Some crayons are broken.	A crayons broken Some crayons broken
10.	The baby felt sick.	Da baby felt sick Da baby felt sick
11.	Her shoe isn't tied.	Her shoe not tied Your shoe is not tied
12.	Let me help you.	Let me help you Let me help you
13.	We've eaten supper.	We eaten supper We ________ supper
14.	His hair had been cut.	His hair is cut His hair is be cut
	5.0	4.14 4.07

Appendix E--Continued

1. Trio$_1$

Karen (M_1)	Angie (C_1)
We're sittin' down We're sitting down	We sit down We sitting down
Mother dropped a spoon Mother dropped a spoon	Mommy drop a spoon Mother dropped a spoon
They won't play They won't play	He won't play Dem not play
She can bring that apple She could bring dat apple	He bring that apple She could bring that apple
It wasn't raining It wasn't rainin'	________ raining Wasn't raining
He wants to jump He wants to jump	He wants a jump He wants a jump
This trains go fast This train goes fast	Choo-choo train fast Dis train go fast
They don't have to run They don't have to run	Dey gonna ________ hafta run
Some crayons are broken Some crayons are broken	Crayons is broken Some crayons is broken
The baby felt sick The baby felt sick	Baby felt sick The baby's felt sick
________ tied Her shoes isn't tied.	Shoes are not ties Her's not tied
Let me help you Let me help you	Lemme help you Lemme help you
We eaten supper We're eaten supper	Gon' eat supper We eaten supper
His hair 'ave been cut His hair 've been cut	He's gon' get cut His hair cut - been cut
4.43 4.86	2.86 3.93

Appendix E--Continued

2. Trio$_2$

	Model Sentence	Ronnie (E_2)
1.	We're sitting down.	We sitting down We sit down
2.	Mother dropped a spoon.	Mommy dropped a spoon Dropped a spoon
3.	They won't play.	They won't play Dey won't play
4.	She can bring that apple.	She can bring dat apple We can bring dat apple
5.	It wasn't raining.	It wasn't raining It wasn't raining
6.	He wants to jump.	He want to jump He want to jump
7.	This train goes fast.	This train goes fast The train go fast
8.	They don't have to run.	Have to run Dey have to run
9.	Some crayons are broken.	Breaken Some crayons broken
10.	The baby felt sick.	Baby felt sick Baby felt sick
11.	Her shoe isn't tied.	Tied Shoe is tied
12.	Let me help you.	Let Let me help you
13.	We've eaten supper.	Eat - we eaten - eat supper We eaten supper
14.	His hair had been cut.	Cut His hair is cut
	5.0	3.29 3.86

2. Trio$_2$

Pamela (M_2)	Tina (C_2)
We sitting down We sitting down	We're sitting down We're sitting down
Dc mother dropped a spoon Mother dropped a spoon	Mother dropped a spoon Mother dropped a spoon
They won' play They won't play	Th' won' play They won't play
____ bring dat apple She's gonna bring dat apple	She c____bring that apple She ____ bring dat apple
It was dis raining Not raining raining	It was raining It wasn't raining
He want to jump He wants jump	He want to jump He want to jump
That train go fast This train go fast	The train go fast Dis train go fast
He got not run They have to run	They don' ___ run - run They have to run
Some crayon is broken Some crayons are broken	Some crayons broken Some crayons broken
A baby felt sick The baby felt sick	Da baby felt sick Da baby felt sick
Her shoe is tied Her shoes are not tied	Her shoe not tied Her shoe ___ tied
Let me help you Lemme help you	Let me help you Lemme help you
We eat supper We eaten supper	We eaten supper We eaten supper
Cut His hair's been cut	A haircut His hairs is cut
3.50 4.21	4.07 4.21

Appendix E--Continued

3. Trio $_3$

Model Sentence	Deedee (E_3)
1. We're sitting down.	We sit down We're sit down
2. Mother dropped a spoon.	Moth' drop a spoon Mommy dropped a spoon
3. They won't play.	Dey won' play Dey - play
4. She can bring that apple.	She could dat apple You bring dat apple
5. It wasn't raining.	It wasn't raining De raining
6. He wants to jump.	He want to jump He want to jump
7. This train goes fast.	This train fast Dis train goes fast
8. They don't have to run.	Dey have - run Dey don't run
9. Some crayons are broken.	Some crayons are broken Some crayons are broken
10. The baby felt sick.	Da baby sick Da baby was sick
11. Her shoe isn't tied.	Her shoe not tied Her shoe is tied
12. Let me help you.	___ me help you Let me help you
13. We've eaten supper.	We've eat supper We've eat supper
14. His hair had been cut.	His hair ___ cut His hair been cut
5.0	3.79 3.93

Appendix E--Continued

3. Trios

Derwin (M_3)	Yvonne (C_3)
I sit down	We sitting down
We sitting down	We're sit down
Mom' drop spoon	Mother drop a spoon
Mother - mother dropped a spoon	Mother drop a spoon
Dey play	Dey won't play
Dey won't play	Dey won't play
She ________	Dat apple
___ bring dat apple	Dat apple
Was raining	Wasn't raining
Not raining	It wasn't raining
Want jump	Jump
He wants - jump	He wants a jump
Train go fast	Fast
Dat train go fast	Dis train dis fast
They can run	_____ have to run
__________hada run	Dey have to run
Crayon broke	Some crayons broken
Some crayons broken	Some crayons are broken
Felt baby sick	Baby felt sick
Baby felt so sick	Baby felt sick
Her shoe was tied	Her shoes tied
Her shoe is tied	Her shoe is tied
Let help me	Let me help you
Lemme help you - help you	Lemme help you
Eat supper	We eaten sup'
Eat supper - we eat supper	We eaten supper
His hair ___ cut	His hair is cut
His hair cut	His hair been cut
2.36	3.29
3.57	4.00

Appendix E--Continued

4. Trio$_4$

Model Sentence	Nancy (E$_4$)
1. We're sitting down.	We're sitting down We is sitting down
2. Mother dropped a spoon.	Mother drop spoon Mommy dropped spoon
3. They won't play.	They won't play Dey won't play
4. She can bring that apple.	She ca' 'at apple Bring dat apple
5. It wasn't raining.	Was raining Wasn't raining
6. He wants to jump.	He wants a jump He wants jump
7. This train goes fast.	Train go fast This train go fast
8. They don't have to run.	They don't have to run They have to run
9. Some crayons are broken.	Some crayons - broken Some crayons broke
10. The baby felt sick.	Baby felt sick Baby felt sick
11. Her shoe isn't tied.	Her shoe is tied Her ___ tied
12. Let me help you.	Lemme help you Lemme help you
13. We've eaten supper.	We eaten supper Eaten supper
14. His hair had been cut.	His hair - cut Hair been cut
5.0	3.93 3.64

Appendix E--Contirued

4. Trio$_4$

Lisa (M_4)	George (C_4)
We sitting down We sitting down	We sitting down We sitting down
Da mother dropped a spoon Mother dropped spoon	Mother dropped a spoon Mother dropped a spoon
Dey won't play Dey won't play	They won't play They won't play
Bring dat apple She can bring dat apple	____ bring dat apple She can bring that apple
Wasn't raining Da ________ raining	It ________ raining It wasn't raining
He wants a jump He wants to jump	To - jump He wants to jump
Dis train go fast This train go fast	This train go fast This train goes fast
Dey have to run They won't have to run	Dey don't have to run They don't have to run
Some crayons broken Some crayons are broken	Crayons are broken Some crayons are broken
Baby felt sick The baby felt sick	Da babe felt sick The baby felt sick
Her shoes was tied Her shoe isn't tied	Her shoe is tie - not tied Her shoe isn't tied
You help me Let me help you	Let me help you Let me help you
We eaten supper We eaten supper	We eaten - eaten supper We eaten supper
His hairs been cut Her hair been cut	His hair been cut His hair been cut
3.79 4.29	4.07 4.79

References

Ausubel, D. P. How reversible are the cognitive and motivational effects of cultural deprivation? Implications for teaching the culturally deprived child. Urban Educ., 1964, 1, 16-38.

Bailey, Beryl L. A proposal for the study of the grammar of Negro English in New York City. Project Literacy Reports, No. 2, Ithaca, New York: Cornell Univ., 1964, 19-22.

Bandura, A., & McDonald, F. J. The influence of social reinforcement and the behavior of models in shaping children's moral judgments. J. Abnorm. soc. Psychol., 1963, 67, 274-281.

Bandura, A., & Walters, R. H. Social learning and personality development. New York: Holt, Rinehart & Winston, 1963.

Bellugi, Ursula. A transformational analysis of the development of negation. In J. Fodor & T. Bever (Eds.), Psycholinguistic Studies: experimental investigations of syntax, forthcoming.

Bellugi, Ursula, & Brown, R. (Eds.) The acquisition of language. Monogr. Soc. Res. Child Developm., 1964, 29, Whole No. 1.

Berko, Jean. The child's learning of English morphology. Word, 1958, 14, 150-177.

Bernstein, B. Linguistic codes, hesitation phenomena and intelligence. Language and Speech, 1962, 5, 31-46 (a).

Bernstein, B. Social class, linguistic codes and grammatical elements. Language and Speech, 1962, 5, 221-240 (b).

Bloom, B. S., Davis, A., & Hess, R. Compensatory education for cultural deprivation. New York: Holt, Rinehart & Winston, 1965.

Bronowski, J. Science as foresight. In J. R. Newman (Ed.), What is science? New York: Washington Square Press, 1961, 408-461.

Brown, R., & Bellugi, Ursula. Three processes in the child's acquisition of syntax. Harvard educ. Rev., 1964, 34, 133-151.

Brown, R., & Fraser, C. The acquisition of syntax. In Ursula Bellugi & R. Brown (Eds.), The acquisition of language. Monogr. Soc. Res. Child Developm., 1964, 29, 43-79.

Carroll, J. B. Determining and numerating adjectives in children's speech. Child Developm., 1939, 10, 215-229.

Carroll, J. B. The study of language. Cambridge: Harvard Univer. Press, 1959.

Carroll, J. B. Language development in children. In S. Saporta (Ed.), Psycholinguistics: a book of readings. New York: Holt, Rinehart & Winston, 1961, 331-345.

Carroll, J. B. Language and thought. Englewood Cliffs, New Jersey: Prentice-Hall, 1964.

Cassler, L. Maternal deprivation: a critical review of the literature. Monogr. Soc. Res. Child Developm., 1961, 26, Whole No. 2.

Chomsky, N. A review of B. F. Skinner's Verbal Behavior. Language, 1959, 35, 26-58.

Chomsky, N. Formal discussion. In Ursula Bellugi & R. Brown (Eds.), The Acquisition of language. Monogr. Soc. Res. Child Developm., 1964, 29, 35-39.

Chomsky, N., & Miller, G. A. Introduction to the formal analysis of natural languages. In R. D. Luce, R. B. Bush, & E. Galanter (Eds.), Handbook of mathematical psychology. Vol. 1. New York: Wiley, 1963, 269-321.

Church, J. Language and the discovery of reality. New York: Random House, 1961.

Cofer, C. N. Comments on the paper by Brown & Fraser. In C. N. Cofer & Barbara Musgrave (Eds.), Verbal behavior and learning. New York: McGraw-Hill, 1963.

Cofer, C. N., & Musgrave, Barbara. (Eds.) Verbal behavior and learning. New York: McGraw-Hill, 1963.

Cooley, W. W., & Lohnes, P. R. Multivariate procedures for the behavioral sciences. New York: Wiley, 1962.

Darley, F. L., & Moll, K. L. Reliability of language measures and size of language sample. J. Speech Hearing Res., 1960. 3, 166-173.

Deese, J. The psychology of learning. (2nd ed.) New York: McGraw-Hill, 1958.

Deutsch, M. The disadvantaged child and the learning process. In A. H. Passow (Ed.), Education in depressed areas. New York: Teachers College, Columbia Univ., 1963, 163-179.

Deutsch, M., & Brown, B. Social influences in Negro-white intelligence differences. J. soc. Issues, 1964, 20, 24-35.

Edwards, A. L. *Experimental design in psychological research.* (Rev. ed.) New York: Holt, Rinehart & Winston, 1960.

Ervin, Susan M. Imitation and structural change in children's language. In E. Lenneberg (Ed.), *New directions in the study of language.* Cambridge: M.I.T. Press, 1964, 163-189.

Ervin, Susan M., & Miller, W. R. Language development. In National Society for the Study of Education, 62nd Yearbook, *Child Development.* Chicago: Univer.. of Chicago Press, 1963, 108-143.

Feldt, L. S. A comparison of the precision of three experimental designs employing a concomitant variable. *Psychometrika*, 1958, 23, 335-353.

Ferguson, G. A. *Statistical analysis in psychology and education.* New York: McGraw-Hill, 1959.

Fraser, C., Bellugi, Ursula, & Brown, R. Control of grammar in imitation, comprehension and production. *J. verb. Learn. verb. Behav.*, 1963, 2, 121-135.

Fries, C. C. *American English grammar.* New York: Appleton-Century, 1940.

Gibson, Eleanor J. Improvement in perceptual judgments as a function of controlled practice or training. *Psychol. Bull.*, 1953, 50, 401-431.

Gleason, H. A. *An introduction to descriptive linguistics.* (Rev. ed.) New York: Holt, Rinehart & Winston, 1961.

Gray, Susan W., & Klaus, R. A. An experimental preschool program for culturally deprived children. Paper read at Amer. Ass. Advancement Sci., Montreal, December, 1964.

Hartup, W. W. Patterns of imitative behavior in young children. *Child Developm.*, 1964, 35, 183-191.

Hilgard, E. R. *Theories of learning.* (2nd ed.) New York: Appleton-Century-Crofts, 1956.

Hockett, C. F. Age-grading and linguistic continuity. *Language*, 1950, 26, 449-457.

Hunt, J. McV. *Intelligence and experience.* New York: Ronald Press, 1961.

Hunt, J. McV. The psychological basis for using preschool enrichment as an antidote for cultural deprivation. *Merrill-Palmer Quart.*, 1964, 10, 209-248.

Irwin, O. C. Infant speech: the effect of family occupational status and of age on use of sound types. *J. Speech Hearing Disorders*, 1948, 13, 224-226.(a).

Irwin, O. C. Infant speech: the effect of family occupational status and of age on sound frequency, J. Speech Hearing Disorders, 1948, 13, 320-323. (b)

Irwin, O. C. Infant speech: the effect of systematic reading of stories. J. Speech Hearing Res., 1960, 3, 187-190.

Jenkins, J. J., & Palermo, D. S. Mediation processes and the acquisition of linguistic structure. In Ursula Bellugi & R. Brown (Eds.), The acquisition of language. Monogr. Soc. Res. Child Developm., 1964, 29, 141-169.

Jespersen, O. Language: its nature, development and origin. London: George Allen & Unwin, 1922.

John, Vera P., & Goldstein, L. S. The social context of language acquisition. Merrill-Palmer Quart., 1964, 10, 265-275.

Katz, J. The philosophy of language, forthcoming.

Kessen, W. "Stage" and "structure" in the study of children. In W. Kessen & Clementina Kuhlman (Eds.), Thought in the young child. Monogr. Soc. Res. Child Developm., 1962, 27, 65-82.

Lane, H., & Schneider, B. Methods for self-shaping echoic behavior. Modern Language J., 1963, 47, 154-160.

Lenneberg, E. H. The capacity for language acquisition. In J. A. Fodor & J. J. Katz (Eds.), The structure of language: readings in the philosophy of language. Englewood Cliffs, New Jersey: Prentice-Hall, 1964, 579-603. (a)

Lenneberg, E. H. A biological perspective of language. In E. H. Lenneberg (Ed.), New directions in the study of language. Cambridge: M.I.T. Press, 1964, 65-88. (b)

Lindquist, E. F. Statistical analysis in educational research. Boston: Houghton Mifflin, 1940.

Loban, W. D. The language of elementary school children. Champaign, Illinois: National Council of Teachers of English, 1963.

Lord, F. M. Further problems in the measurement of growth. Educ. psychol. Measmt, 1958, 18, 437-451.

McCarthy, Dorothea. Language development in children. In L. Carmichael (Ed.), A manual of child psychology. (2nd ed.) New York: Wiley, 1954, 492-630.

McNeill, D. Developmental psycholinguistics. In J. Fodor & T. Bever (Eds.), Psycholinguistic studies: experimental investigations of syntax, forthcoming.

Menyuk, Paula. A preliminary evaluation of grammatical capacity in children. J. verb. Learn. verb. Behav., 1963, 2, 429-439.

Miller, G. A. Foreword by a psychologist. In Ruth H. Weir, Language in the crib. The Hague: Mouton, 1962.

Miller, W., & Ervin, Susan. The development of grammar in child language. In Ursula Bellugi & R. Brown (Eds.), The acquisition of language. Monogr. Soc. Res. Child Developm., 1964, 29, 9-34.

Milner, Esther. A study of the relationship between reading readiness in grade one school children and patterns of parent-child interaction. Child. Developm., 1951, 22, 95-112.

Minifie, F. C., Darley, F. L., & Sherman, Dorothy. Temporal reliability of seven language measures. J. Speech Hearing Res., 1963, 6, 139-148.

Nisbet, J. Family environment and intelligence. In A. H. Halsey, J. Floud, & G. A. Anderson (Eds.), Education, economy and society. Glencoe, Ill.: Free Press, 1961, 273-287.

Pettigrew, T. F. A profile of the Negro American. Princeton: D. Van Nostrand, 1964.

Province, Sally, & Lipton, Rose C. Infants in Institutions. New York: International Universities Press, 1962.

Rheingold, Harriet L. The measurement of maternal care. Child Developm., 1960, 31, 565-575.

Rheingold, Harriet L. The effect of environmental stimulation upon social and exploratory behavior in the human infant. In B. M. Foss (Ed.), Determinants of infant behavior. London: Methuen, 1961.

Rheingold, Harriet L., Gewirtz, J. L., & Ross, Helen W. Social conditioning of vocalizations in the infant. J. comp. physiol. Psychol., 1959, 52, 68-73.

Salzinger, Suzanne, Salzinger, J., Portnoy, Stephanie, Eckman, Judith, Bacon, Pauline M., Deutsch, M., & Zubin, J. Operant conditioning of continuous speech in young children. Child Developm., 1962, 33, 683-695.

Seashore, H. & Bavelas, A. The functioning of knowledge of results in Thorndike's line-drawing experiment. Psychol. Rev., 1941, 48, 155-164.

Siegel, S. Nonparametric statistics for the behavioral sciences. New York: McGraw-Hill, 1956.

Sievers, Dorothy J. Development and standardization of a test of psycholinguistic growth in preschool children. Unpublished doctoral dissertation, Univer. of Illinois, 1955.

Slobin, D. I. Preliminary outline of pilot studies on relations of comprehension and speech in pre-school children. Project Literacy Reports. No. 2. Ithaca, New York: Cornell Univer., 1964, 31-36.

Smith, Madora E. A study of some factors influencing the development of the sentence in preschool children. J. genet. Psychol., 1935, 46, 182-212.

Staats, A. W., & Staats, Carolyn K. Complex human behavior. New York: Holt, Rinehart & Winston, 1964.

Templin, Mildred C. Certain language skills in children: their development and interrelationships. Minneapolis: The Univer. of Minnesota Press, 1957.

Twaddell, W. F. The English Verb Auxiliaries. Providence: Brown Univer. Press, 1963.

Weissberg, P. Social and non-social conditioning of infant vocalizations. Child Developm., 1963, 34, 377-388.

Wiener, N. The human use of human beings. (2nd ed.) Garden City, New York: Doubleday, 1954.

Winitz, H. Language skills of male and female kindergarten children. J. Speech Hearing Res., 1959, 2, 377-386.

World Health Organization. Deprivation of maternal care: a reassessment of its effects. Geneva: Author, 1962.

Wortis, H., Bardach, J. L., Cutler, R., Rue, R., & Freedman, A. Child-rearing practices in a low socioeconomic group. Pediatrics, 1963, 32, 298-307.

Yarrow, L. J. Separation from parents during early childhood. In M. L. Hoffman & Lois W. Hoffman (Eds.), Review of child development research. New York: Russell Sage Foundation, 1964, pp. 89-136.

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